THE American Journal OF Gastroenterology

VOL. 28, NO. 3 SEPTEMBER, 1957

CONVENTION NUMBER

Program, 22nd Annual Convention and Course in Postgraduate Gastroenterology—Pages *1-32*

Liver Function Tests

Roentgen Studies of the Biliary Tract

Management of Obstructive Jaundice

The Laboratory Diagnosis of Pancreatic Disease

Clinicopathological Conference

Twenty-second Annual Convention
The Somerset
Boston, Mass., 21, 22, 23 October 1957

Course in Postgraduate Gastroenterology
The Somerset
Boston, Mass., 24, 25, 26 October 1957

Official Publication
AMERICAN COLLEGE
OF GASTROENTEROLOGY

787100

safe hydrochloric acid therapy in tasteless pulvule form

ACIDULIN

(Glutamic Acid Hydrochloride, Lilly)

the easy, pleasant way to administer hydrochloric acid

'Acidulin' offers your patient complete freedom from unpleasant taste and from injury to the mucous membranes and teeth. It is convenient and safe to carry when traveling or dining out.

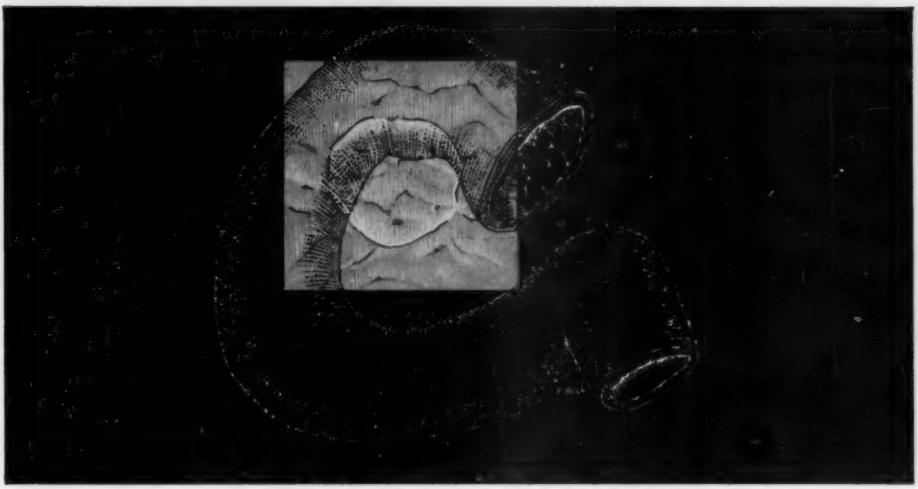
Each pulvule is equivalent to about 10 minims of Diluted Hydrochloric Acid, N.F. For the average patient with hypochlorhydria or achlorhydria, 1 to 3 Pulvules 'Acidulin' before meals are usually adequate.

Supplied in bottles of 100, 500, and 1,000.

ELI LILLY AND COMPANY • INDIANAPOLIS 6, INDIANA, U. S. A.

VISIT THE EXHIBITS

RELIEVES THE GNAWING ACHE



Pro-Banthine® provides rapid control of pain in peptic ulcer

In a two-year study[1] by Lichstein and coworkers, documented by intensive personal observation and by follow-up studies, Pro-Banthine (brand of propantheline bromide) often brought immediate relief of ulcer pain. Patients (11 per cent) who did not respond satisfactorily to Pro-Banthine therapy had "anxiety manifestations of psychoneurotic proportions."

In addition to frequent immediate symptomatic relief, Pro-Banthine reduces gastrointestinal motility and diminishes the secretion and acidity of gastric juice, all-important factors in the generation and aggravation of peptic ulcer.

These actions of Pro-Banthine and its demonstrated effectiveness in accelerating ulcer healing[2-5] mark the drug as a most valuable adjunct in the treatment of peptic ulcer.

The suggested initial dosage is one 15-mg. tablet with meals and two tablets at bedtime. An increased dosage may be necessary for severe manifestations and then two or more tablets four times a day may be prescribed.

G. D. Searle & Co., Chicago 80, Illinois.
Research in the Service of Medicine.

---

1. Lichstein, J.; Morehouse, M. G., and Osmon, K. L.: Am. J. M. Sc. *232*:156 (Aug.) 1956.

2. Sun, D. C. H., and Shay, H.: Arch. Int. Med. *97*:442 (April) 1956.

3. Rafsky, H. A.; Fein, H. D.; Breslaw, L., and Rafsky, J. C.: Gastroenterology *27*:21 (July) 1954.

4. Schwartz, I. R.; Lehman, E.; Ostrove, R., and Seibel, J. M.: Gastroenterology *25*:416 (Nov.) 1953.

5. Silver, H. M.; Pucci, H., and Almy, T. P.: New England J. Med. *252*:520 (March 31) 1955.

SEARLE

SEE OUR EXHIBIT AT BOOTH 13

gentle

is the word

for Noludar

Mild, yet positive in action, Noludar 'Roche' is especially suited for the tense patient who needs to relax and remain clear-headed—or for the insomniac who wants a refreshing night's sleep without hangover. Not a barbiturate, not habit-forming. Tablets, 50 and 200 mg; elixir, 50 mg per teasp.

Noludar® brand of methyprylon
(3,3-diethyl-5-methyl-
2,4-piperidinedione)

ROCHE

Original Research in
Medicine and Chemistry

SEE OUR EXHIBIT AT BOOTH 13

VOL. 28, No. 3 SEPTEMBER, 1957

THE American Journal OF Gastroenterology

(FORMERLY THE REVIEW OF GASTROENTEROLOGY)

The Pioneer Journal of Gastroenterology, Proctology and Allied Subjects in the United States and Canada

CONVENTION NUMBER

contents:

Editorial Board and General Information 206

Liver Function Tests: Their Clinical Significance with Special Emphasis on Elevations of Alkaline Phosphatase and Cholesterol...M. A. SPELLBERG, B.S., M.S., M.D., F.A.C.P., F.A.C.G. 219

Roentgen Studies of the Biliary Tract: An Evaluation of Recent Contributions WILLIAM H. SHEHADI, M.D. 236

Management of Obstructive Jaundice JULIAN A. STERLING, M.D., Sc.D., F.A.C.S., F.A.C.G. 253

The Laboratory Diagnosis of Pancreatic Disease: Secretin Test DAVID A. DREILING, M.D. and HENRY D. JANOWITZ, M.D. 268

Visceral Manifestations of Occlusive Disease of the Intestinal Blood Vessels GERALD H. PRATT, M.D., F.A.C.S. 280

Antibiotics and Colon Surgery ISIDORE COHN, JR., M.D., D.Sc. (Med.), F.A.C.G. 298

Clinicopathological Conference 311

President's Message 323

News Notes 324

Convention Program *1-32*

Abstracts for Gastroenterologists 330

Book Reviews for Gastroenterologists 342

Owned and published monthly by the American College of Gastroenterology, Inc. Business Office: 33 West 60th St., New York 23, N. Y. Editorial Office: 435 East 79th Street, New York 21, N. Y. Copyright© 1957, by the American College of Gastroenterology, Inc. Subscription rate, U. S. and possessions: One year $8.00, two years $14.00 (foreign $10.00, $18.00). Single copy: $.75. Reentered as second class matter at the Post Office at New York, N. Y., under the act of March 3, 1879.

Index to Advertisers

American Ferment Co., Inc. 347
Ames Co., Inc. 218
Burton, Parsons & Co. ..... 3rd cover
Coca-Cola Co. 321
Eder Instrument Co. 354
Hoffmann-La Roche, Inc. 204, 216, 217
Lakeside Laboratories 353
Lederle Laboratories 214, 215
Lilly, Eli & Co. ..... 2nd cover
Merck Sharp & Dohme 207
National Drug Co., The 345
Organon, Inc. 346
Pfizer Laboratories 213, 351
Quaker Oats Co., The 210
ROR Chemical Co. 344
Rorer, Wm. H., Inc. 209
Searle, G. D., & Co. 203, 322
Smith, Kline & French Laboratories 352
Squibb 208
Standard Pharmaceutical Co., Inc. 354
U. S. Vitamin Corp. 348, 349
Wallace Laboratories 355, 356
Warner-Chilcott Laboratories ..... 4th cover
Winthrop Laboratories 211, 212

OFFICIAL PUBLICATION

of the

AMERICAN COLLEGE OF GASTROENTEROLOGY

33 West 60th Street, New York 23, N. Y.

Editorial Office, 435 East 79th Street, New York 21, N. Y.

SAMUEL WEISS, *Editor-in-Chief*

EDITORIAL BOARD

JAMES A. FERGUSON
MILTON J. MATZNER
J. R. VAN DYNE
MICHAEL W. SHUTKIN

EDITORIAL COUNCIL

ANTHONY BASSLER
F. W. BANCROFT
RICHARD BAUER
BENJAMIN M. BERNSTEIN
THEODOR BLUM
DONOVAN C. BROWNE
JOSE OVEIDO BUSTOS
LOUIS H. CLERF
FRANK A. CUMMINGS
FELIX CUNHA
HARRY M. EBERHARD
RUDOLF R. EHRMANN
LYNN A. FERGUSON
CHEVALIER L. JACKSON
WILLIAM C. JACOBSON
I. R. JANKELSON
SIGURD W. JOHNSEN
ARTHUR A. KIRCHNER
WILLIAM W. LERMANN
FRANZ J. LUST
CHARLES W. MCCLURE
JOHN M. MCMAHON
LESTER M. MORRISON
GEORGE G. ORNSTEIN
GEORGE T. PACK
MARTIN E. REHFUSS
A. X. ROSSIEN
DAVID J. SANDWEISS
JOSEPH SCHROFF
MARKS S. SHAINE
I. SNAPPER
JULIAN A. STERLING
J. EARL THOMAS
MAX THOREK
C. J. TIDMARSH
GABRIEL TUCKER
F. H. VOSS
MICHAEL WEINGARTEN
LESTER R. WHITAKER
FRANK C. YEOMANS

Publication Office, 33 West 60th Street, New York 23, N. Y.

DANIEL WEISS, *Managing Editor*

STEVEN K. HERLITZ, *Advertising Manager*

Contributions: Articles are accepted for publication on condition that they are contributed solely to THE AMERICAN JOURNAL OF GASTROENTEROLOGY. Manuscripts should be typewritten double-spaced and submitted in two copies. Footnotes and bibliographies should conform to the style recommended by the American Medical Association, illustrations and diagrams should carry suitable lettering and explanations, be mounted on separate pages and have the name of the author on each page. Four illustrations per article are allowed without cost to the author.

Reviews: THE AMERICAN JOURNAL OF GASTROENTEROLOGY will review monographs and books dealing with gastroenterology or allied subjects. It may be impossible to review all material sent. However, an acknowledgement will be made in the Department of Reviews.

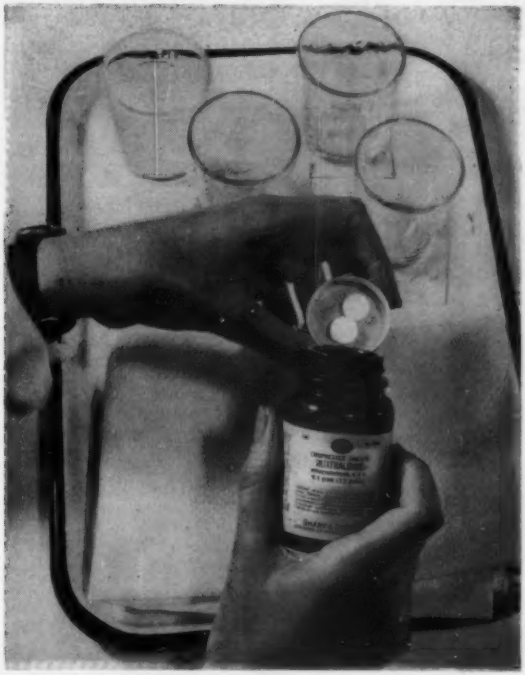
The editors and publishers are not responsible for individual opinions expressed by their contributors, nor for those given under current literature.

Reprints: A price list and order blank for reprints will be sent to each contributor before the journal is issued.

Subscription price: U.S. and possessions: one year, $8.00, two years, $14.00. Elsewhere, $10.00, $18.00. Single copy $.75. Members of the American College of Gastroenterology receive the JOURNAL as part of their membership.

Change of Address: Notify publishers promptly of change of address. Notices should give both old and new addresses.

U. S. Vitamin Corp. 348, 349
Wallace Laboratories 355, 356
Warner-Chilcott Laboratories ..... 4th cover
Winthrop Laboratories 211, 212



A good start for safer bowel surgery

SULFATHALIDINE®

PHTHALYLSULFATHIAZOLE

The virtual "sterilization" of pathogenic bowel contents which follows preoperative administration of SULFATHALIDINE eliminates a major danger in intestinal surgery. Postoperatively, SULFATHALIDINE continues the suppression of dangerous pathogens, lessens the likelihood of peritonitis and abscess formation. Flatus is minimal; fungi and yeast do not overgrow their habitat; early healing is promoted. SULFATHALIDINE is an important adjunct in ulcerative colitis.

CREMOTHALIDINE® is a palatable suspension of SULFATHALIDINE. Each 30 cc. (1 fluidounce) contains 6.0 Gm. SULFATHALIDINE.

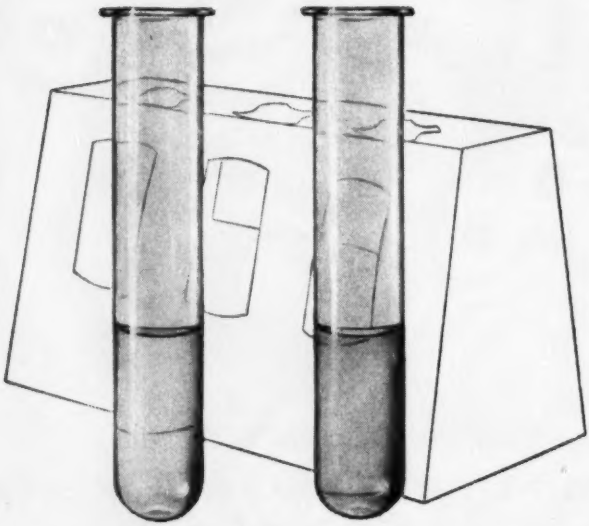
MERCK SHARP & DOHME

DIVISION OF MERCK & CO., INC., PHILADELPHIA 1, PA.

VISIT THE EXHIBITS

NOW! without intubation

new accurate color test for gastric acidity...



DIAGNEX BLUE

Squibb Azure A Carbacrylic Resin Diagnostic Test

as simple as **A-B-C**

A. The patient takes DIAGNEX BLUE.

B. Urine samples are returned to the physician.

C. Simple color comparison denotes gastric acidity.

No special equipment needed.

qualitative accuracy—<u>without intubation</u>

SQUIBB Squibb Quality—the Priceless Ingredient

"DIAGNEX" ® IS A SQUIBB TRADEMARK

SEE OUR EXHIBIT AT BOOTH 19

"...More Maalox! Well, that's one antacid they all seem to like—works like a charm, doesn't constipate, tastes good—no problems..."

MAALOX®, an efficient antacid suspension of magnesium-aluminum hydroxide gel;
Bottles of 12 fluidounces; Tablets, 0.4 Gm., Bottles of 100.
Samples on request.
WILLIAM H. RORER, INC., Philadelphia 44, Pennsylvania

SEE OUR EXHIBIT AT BOOTH 33

The Why of Oatmeal

Take a moment to consider *why* oatmeal is recommended in virtually all therapeutic diets... *why* it is so widely used as a first solid food for infants...*why* it is suggested so frequently in geriatric diets...and *why* it is the favorite breakfast dish of millions.

Patients whose digestive tracts must be pampered with bland, restricted-fiber, semisolid or other limited menus, must obtain their daily nutrition from easily digested, easily assimilated foods offering high nutrient value.

Oatmeal-and-milk (whole or skim) is a food of choice in all such diets—for several reasons—and not only for breakfast: its soft particulate texture ...its appealing taste...its almost complete digestibility...its rich supply of protein...and its B vitamins and minerals. Even such individualized diets as low purine, low fat, low salt, and many others give broad recognition to oatmeal because it provides high nutritional value without interfering with most dietary restrictions.

These are the reasons, too, why oatmeal is widely recommended as the first solid food for the three-month-old infant's delicate digestive tract...and for the oldster whose changing dietary habits often make adequate protein nutrition difficult.

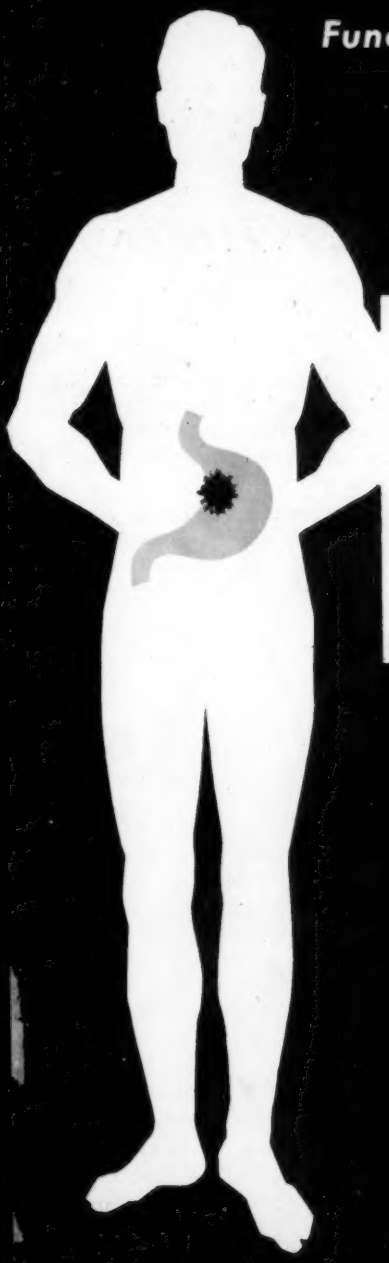
And for the millions of energetic men, women, and children who need and appreciate a good, sturdy breakfast every day, oatmeal—for the same reasons—presents a very real nutritional plus.

Quaker Oats and Mother's Oats, the two brands of oatmeal offered by The Quaker Oats Company, are identical. Both brands are available in the Quick (cooks in one minute) and the Old-Fashioned varieties which are of equal nutrient value.

IN GASTROINTESTINAL AFFECTIONS. Oatmeal fits well into the dietary management of gastrointestinal disease. It is bland, mechanically nonirritating, low in residue, yet high in its contribution of available protein, vitamins and minerals.

The Quaker Oats Company
CHICAGO

VISIT THE EXHIBITS



Functional and Organic Control

of PEPTIC ULCER

Gastro-Intestinal
Irritability and Tension

MONODRAL®
with MEBARAL®
TABLETS

Potent

ANTISECRETORY • ANTICHOLINERGIC • SEDATIVE

Each tablet contains:

Monodral bromide	**5 mg.**
Mebaral	**32 mg.**

PROVIDES

Dependable control of hyperacidity and hypermotility. Spasmolysis. Prompt and prolonged pain relief. Tranquillity without drowsiness.

DOSE

Peptic ulcer, 1 or 2 tablets three or four times daily. Other gastro-intestinal disorders, 1 tablet three or four times daily.

SUPPLIED Bottles of 100 tablets.

Monodral (brand of penthienate) and Mebaral (brand of mephobarbital), trademarks reg. U. S. Pat. Off.

Protective Coating with

Creamalin

PIONEER ALUMINUM HYDROXIDE GEL

FAST ACTING REACTIVE GEL

For best results in PEPTIC ULCER

Prescribe Monodral® Mebaral® tablets in conjunction with Creamalin

Protective coating and mild astringent effect of CREAMALIN promote healing of peptic ulcer.
CREAMALIN
Inhibition of vagus nerve by MONODRAL with MEBARAL results in reduction of acidity and hypermotility

DOSE:
From 2 to 4 teaspoonfuls Creamalin liquid or from 2 to 4 Creamalin tablets (well chewed) every two to four hours, with a small amount of water or milk.

Creamalin liquid — 8 and 16 fl. oz.
Creamalin tablets — bottles of 50 and 200.

Winthrop LABORATORIES NEW YORK 18, N. Y.

Creamalin (brand of aluminum hydroxide gel), Monodral (brand of pentithiazole) and Mebaral (brand of mephobarbital), trademarks reg. U. S. Pat. Off.

For the
greatest
potential value
and the
least probable risk

SIGNEMYCIN* V

OLEANDOMYCIN TETRACYCLINE-PHOSPHATE BUFFERED

multi-spectrum potentiated therapy . . . buffered for higher, faster antibiotic levels . . . adds new certainty in antibiotic therapy . . . *particularly for that 90% of the patient population treated at home or office when susceptibility testing is* not *practical—*

Supplied:

SIGNEMYCIN V CAPSULES containing 250 mg. (oleandomycin 83 mg., tetracycline 167 mg.), phosphate buffered. Bottles of 16 and 100.

SIGNEMYCIN† CAPSULES—250 mg. (oleandomycin 83 mg., tetracycline 167 mg.), bottles of 16 and 100; 100 mg. (oleandomycin 33 mg., tetracycline 67 mg.), bottles of 25 and 100.

SIGNEMYCIN FOR ORAL SUSPENSION—1.5 Gm., 125 mg. per 5 cc. teaspoonful (oleandomycin 42 mg., tetracycline 83 mg.), mint flavored, bottles of 2 oz.

SIGNEMYCIN INTRAVENOUS—500 mg. vials (oleandomycin 166 mg., tetracycline 334 mg.), and 250 mg. vials (oleandomycin 83 mg., tetracycline 167 mg.); buffered with ascorbic acid.

Pfizer

PFIZER LABORATORIES, Brooklyn 6, N. Y.
Division, Chas. Pfizer & Co., Inc.

World leader in antibiotic development and production

*Trademark
†Trademark, oleandomycin tetracycline

SEE OUR EXHIBIT AT BOOTH 26

NEW PATHIB

combines **Meprobamate** *(400 mg.):*

Widely prescribed tranquilizer-muscle relaxant. Effectiveness in anxiety and tension states clinically demonstrated in millions of patients. Meprobamate acts only on the central nervous system. Does not increase gastric acid secretion. It has no known contraindications, can be used over long periods of time.[1,2,3]

with **Pathilon** *(25 mg.):*

An anticholinergic noted for its extremely low toxicity and high effectiveness in the treatment of G.I. tract disorders. In a comparative evaluation of currently employed anticholinergic drugs, PATHILON ranked high in clinical results, with few side effects, minimal complications, and few recurrences.[4]

Now...with **PATHIBAMATE**...*you can control disorders of the digestive tract and the "emotional overlay" so often associated with their origin and perpetuation...without fear of barbiturate loginess, hangover or addiction. Among the conditions which have shown dramatic response to* **PATHIBAMATE** *therapy:*

DUODENAL ULCER • GASTRIC ULCER • INTESTINAL COLIC
SPASTIC AND IRRITABLE COLON • ILEITIS • ESOPHAGEAL SPASM
ANXIETY NEUROSIS WITH G.I. SYMPTOMS • GASTRIC HYPERMOTILITY

BAMATE*

Meprobamate with PATHILON® LEDERLE

Comments on PATHIBAMATE *from clinical investigators*

- "I find it easy to keep patients using the drug continuously and faithfully. I feel sure this is due to the desirable effect of the tranquilizing drug."[5]

- "The results in several people who were previously on belladonna-phenobarbital preparations are particularly interesting. Several people volunteered that they felt a great deal better on the present medication and noted less of the loginess associated with barbiturate administration."[6]

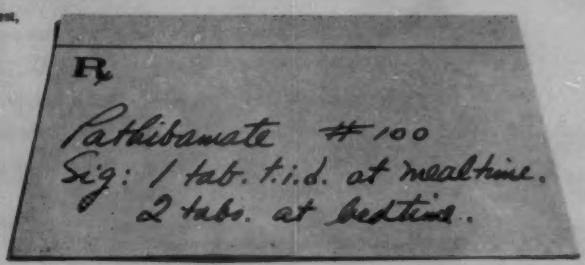
- PATHIBAMATE..."will favorably influence a majority of subjects suffering from various forms of gastrointestinal neurosis in which spasmodic manifestations and nervous tension are major clinical symptoms."[7]

- "In the patients with functional disturbances of the colon with a high emotional overlay, this has been to date a most effective drug."[5]

References: 1. Borrus, J. C.: *M. Clin. North America*, In press, 1957. 2. Gillette, H. E.: *Internat. Rec. Med. & G. P. Clin.* 169:433, 1956. 3. Pennington, V. M.: *J.A.M.A.*, In press, 1957. 4. Cayer, D.: Prolonged Anticholinergic Therapy of Duodenal Ulcer. Am. J. Dig. Dis. 1:301-309 (July) 1956. 5. McGlone, F. B.: Personal Communication to Lederle Laboratories. 6. Texter, E. C., Jr.: Personal Communication to Lederle Laboratories. 7. Bauer, H. G. and McGavack, T. H.: Personal Communication to Lederle Laboratories.

Supplied: Bottles of 100 and 1000

Administration and Dosage: 1 tablet three times a day at mealtimes and 2 tablets at bedtime. Full information on PATHIBAMATE available on request, or see your local Lederle representative.



Lederle LEDERLE LABORATORIES DIVISION, AMERICAN CYANAMID COMPANY, PEARL RIVER, NEW YORK

*Trademark ®Registered Trademark for Tridihexethyl Iodide Lederle

announcing

MARSILID

(Iproniazid) 'Roche'

Marsilid 'Roche' is a psychic energizer — the very opposite of a tranquilizer. It is useful not only for mild and severe depression but for stimulation of appetite and weight gain, and in chronic debilitating disorders.

Q. What is Marsilid?

A. Marsilid (iproniazid) is an amine oxidase inhibitor which affects the metabolism of serotonin, epinephrine, norepinephrine and other amines.

Q. How does Marsilid act?

A. Marsilid has a normal eudaemonic* rather than an abnormal euphoric effect; it promotes a feeling of well-being and increased vitality; it restores depleted energy and stimulates appetite and weight gain in chronic debilitating disorders.

Q. How soon is the effect of Marsilid apparent?

A. Marsilid is a slow-acting drug. In mild depression it usually takes effect within a week or two; in severe psychotics, results may be apparent only after a month or more.

Q. What are the indications for Marsilid?

A. Mild depression in ambulatory, non-psychotic patients; psychoses associated with severe depression or regression; stimulation of appetite and weight gain in debilitated patients; chronic debilitating disorders; stimulation of wound healing in draining sinuses (both tuberculous and non-tuberculous); adjunctive therapy in rheumatoid arthritis when associated with depressed

*Eudaemonia is a feeling of well-being or happiness; in Aristotle's use, felicity resulting from life of activity in accordance with reason.

a psychic energizer

(the opposite of a tranquilizer)

psychomotor activity (Marsilid stimulates physical and mental activity, appetite and weight gain without objective joint changes).

Q. What is the dosage of Marsilid?

A. The daily dose of Marsilid should not exceed 150 mg (50 mg t.i.d.). In patients who are not hospitalized, the dosage should be reduced after the first 8 weeks to an average of 50 mg daily or less, for Marsilid is a cumulative drug. Like all potent drugs, Marsilid requires careful individual dosage adjustment.

Q. What are the potential side effects of Marsilid?

A. Side effects due to Marsilid are reversible upon reduction of dosage or cessation of therapy. It may cause constipation, hyperreflexia, paresthesias, dizziness, postural hypotension, sweating, dryness of mouth, delay in starting micturition, and impotence.

Q. When is Marsilid contraindicated?

A. Marsilid is contraindicated in overactive, overstimulated or agitated patients. Marsilid therapy should be discontinued two days before the use of ether anesthesia. It should not be given together with cocaine or meperidine. In patients with impaired kidney function, Marsilid should be used cautiously to prevent accumulation. Marsilid is not recommended in epileptic patients.

Q. How is Marsilid supplied?

A. Marsilid is supplied in scored 50-mg, 25-mg and 10-mg tablets.

MARSILID® PHOSPHATE — brand of iproniazid phosphate (1-isonicotinyl-2-isopropylhydrazine phosphate)

HOFFMANN-LA ROCHE INC • NUTLEY 10 • NEW JERSEY

simple, well-tolerated routine for "sluggish" older patients

one tablet t.i.d.

DECHOLIN®

"therapeutic bile"

Establishes free drainage of biliary system—effectively combats bile stasis and improves intestinal function.

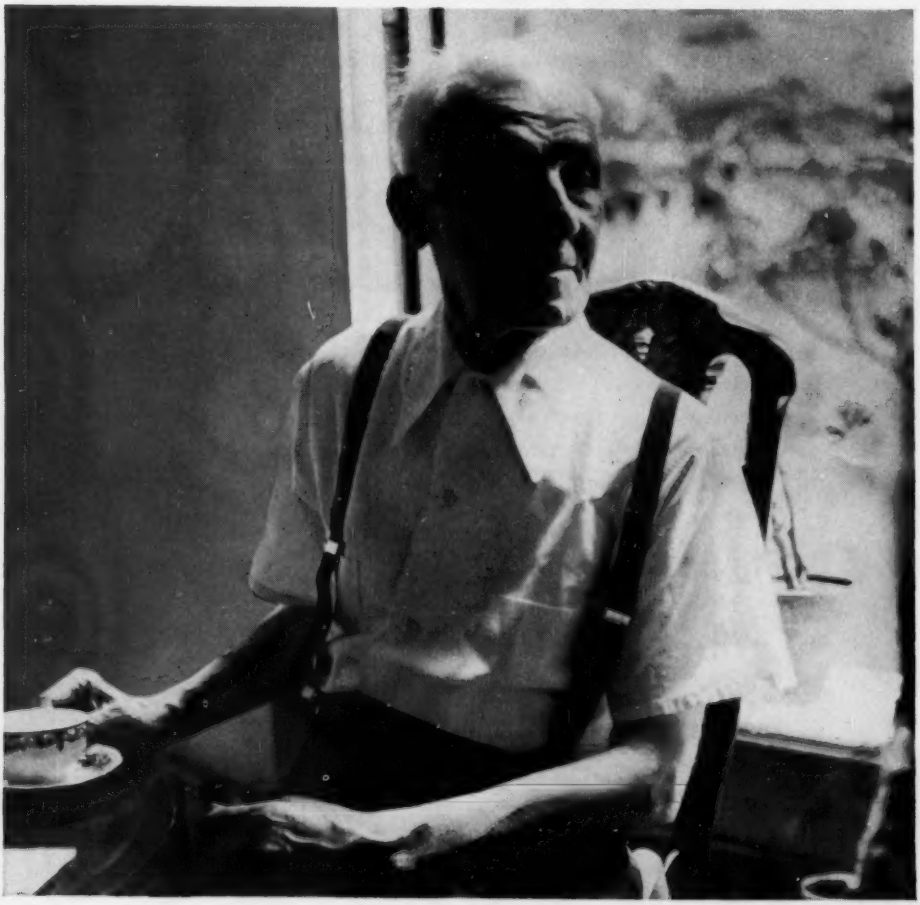
Corrects constipation without catharsis—copious, free-flowing bile overcomes tendency to hard, dry stools and provides the natural stimulant to peristalsis.

Relieves certain G.I. complaints—improved biliary and intestinal function enhance medical regimens in hepatobiliary disorders.

DECHOLIN Tablets: (dehydrocholic acid, AMES) 3¾ gr.

23787

AMES COMPANY, INC · ELKHART, INDIANA · Ames Company of Canada, Ltd., Toronto



SEE OUR EXHIBIT AT BOOTH 25

THE American Journal OF Gastroenterology

A monthly journal of Gastroenterology, Proctology and Allied Subjects
(FORMERLY THE REVIEW OF GASTROENTEROLOGY)

VOLUME 28 SEPTEMBER, 1957 NUMBER 3

LIVER FUNCTION TESTS: THEIR CLINICAL SIGNIFICANCE WITH SPECIAL EMPHASIS ON ELEVATIONS OF ALKALINE PHOSPHATASE AND CHOLESTEROL*

M. A. SPELLBERG, B.S., M.S., M.D., F.A.C.P., F.A.C.G.†

Chicago, Ill.

The liver is one of the most remarkable organs in the mammalian organism. Its three distinctive cells: the bile duct cells, the Kupffer cells and parenchymal cells perform hundreds of functions. Biochemical tests which reflect some of these functions form one side of the triangle in the diagnosis of liver disease. The other two sides of the triangle are the clinical and anatomical approach (liver biopsy). Liver function tests are useful:

1. In the differential diagnosis of jaundice. 2. In ascertaining the presence of liver disease, either in other diseases or in primary liver disease. 3. In evaluating the prognosis of liver damage. 4. In evaluating the response to therapy.

In the interpretation of liver function tests one must keep several principles in mind. Because of the great number of functions that the liver performs it is not feasible to test all these patients. In my book, "Diseases of the Liver"[20], 64 tests are described, but even this large number of tests does not investigate many of the functions of the liver. Therefore, if the small group of tests generally performed by a clinical laboratory show a normal response it is not unequivocal evidence of the complete functional integrity of the liver.

The enormous reserve power of the liver is another drawback in its functional evaluation. As much as 80 per cent of the liver of an animal can be extirpated before functional abnormality is detected. Therefore, in most instances, abnormal liver function is a manifestation of advanced anatomic alterations.

On the other hand, some of the liver function tests are hypersensitive and may give false positive reactions. Because of the nature of some of these tests,

*Presented before the Course in Postgraduate Gastroenterology of the American College of Gastroenterology, New York, N. Y., 18, 19, 20 October 1956.

†Clinical Associate Professor of Medicine, University of Illinois. Attending Physician, Michael Reese Hospital, Chicago, Ill.

they may be influenced by extrahepatic factors and therefore their abnormality may not signify the presence of hepatic dysfunction.

It is useful for clinical purposes to divide liver function tests into two groups: 1. Tests indicative of disturbed function of the parenchymal cells. 2. Tests indicative of disturbed integrity of the cholangioles and bile ducts. This division is useful in applying liver function tests to the differential diagnosis of jaundice. An attempt will also be made to group the tests in relation to the function which they reflect. In this fashion one can gain a clearer picture of the basic functional aberrations, and the interrelations and interdependence of various tests.

Table I lists the commonly used tests and the basic functions of the liver to which they are related.

TABLE I.

I. Tests Indicative of Parenchymal Dysfunction:
   1. Tests Related to Disturbances of Albumin and Globulin Synthesis
      a. Serum Albumin decreases
      b. Serum Globulin increases (chiefly gamma globulin)
      c. Thymol turbidity over 5 units
      d. Thymol flocculation over 1 plus
      e. Cephalin Cholesterol flocculation over 1 plus
      f. Gamma Globulin turbidity over 3 units
      g. Zinc Sulfate turbidity over 12 units.
      h. Colloidal Gold, 2 plus or over
      i. Colloidal Red, 2 plus or over
   2. Tests Related to Special Protein Synthesis
      a. Hypoprothrombinemia
   3. Tests Related to Disturbed Lipid Metabolism
      a. Decrease in cholesterol esters
      b. Decrease in total cholesterol
   4. Tests Related to Disturbed Carbohydrate Metabolism
      a. Galactose tolerance test
      b. Glucose tolerance test
   5. Test Related to Enzyme Alterations
      a. Cholinesterase decreases
   6. Excretory Functions
      a. Bromsulfalein excretion

II. Tests Related to Biliary Obstruction
   1. Serum bilirubin elevation
   2. Alkaline phosphatase elevation above 10 Bodansky units
   3. Total cholesterol elevation.

Enterohepatic Circulation of Bile Pigments and the Differential Diagnosis of Jaundice

Before we discuss in greater detail the blood chemical determinations listed in Table I, it will be shown how an understanding of the enterohepatic circulation of bile pigments is useful in the differential diagnosis of jaundice.

Figures 1 and 2 illustrate in diagrammatic fashion the enterohepatic circulation of bile pigments in a normal individual, in prehepatic, hepatic and posthepatic jaundice. Bilirubin, which is formed chiefly (90 per cent) in the reticuloendothelial system of the bone marrow, from the hemo fraction of hemoglobin, is excreted by the liver into the intestines through the bile ducts. In the intestines, primarily the colon, the bilirubin is reduced to urobilinogen by bacterial action. Therefore, bilirubin must be excreted into the intestinal tract for urobilinogen to be formed. Rarely bacterial infection of the intrahepatic bile ducts may result in the formation of urobilinogen within the extrahepatic bile ducts.

It will be noted from Figures 1 and 2 that in the normal individual a small amount of urobilinogen is reabsorbed from the gastrointestinal tract and this is re-excreted by the liver into the intestines. Only about 3 mg. of this pigment is normally excreted by the kidneys in 24 hours. This amount gives only a mildly positive reaction with Ehrlich's diazo reagent, when the urine is diluted 1:10. In prehepatic, or hemolytic jaundice, an excessive amount of bilirubin is formed, therefore an excessive amount of urobilinogen is formed and absorbed from the intestines. This larger amount is not completely re-excreted by the slightly impaired liver, but is excreted by the kidneys and therefore there is an increased amount of urobilinogen in the urine, which gives a positive diazo reaction in high dilutions. Since the 1-minute bilirubin in the plasma is not high, the hyperbilirubinemia being chiefly of the delayed reacting type which is not excreted by the kidneys, there is no bilirubinuria. The stool urobilinogen is high.

TABLE II

	Urine		Feces
Jaundice	Urobilinogen	Bilirubin	Urobilinogen
Prehepatic	Markedly +	Negative	Very High
Hepatic	Positive	Positive	Decreased
Posthepatic	Negative	Positive	Absent

In hepatic or hepatocellular jaundice there is no excess of bilirubin formed. The impaired liver is unable to excrete the normal amount of bilirubin formed, and shows even greater incapacity to excrete the smaller amount of urobilinogen reaching it. In this situation both pigments are excreted by the kidneys. The stool urobilinogen is decreased.

In posthepatic, surgical or obstructive jaundice, if the obstruction is complete, no bilirubin reaches the gastrointestinal tract. There is therefore, no urobilinogen in the stools and none is excreted in the urine. The urine however contains an abundance of bilirubin.

Table II summarizes the pigment findings in the urine and stools. By these simple office procedures one can in many instances differentiate these three types of jaundice.

Serum Protein Alterations

Serum protein alterations in advanced liver disease, have been observed many years ago[5,23]. With the use of the electrophoretic apparatus serum protein changes have been observed in early and mild hepatic disease[9]. These observations are confirmed by chemical technics which more adequately separate albumin from the globulins[21]. A significant drop of the serum albumin is a manifestation of severe and advanced liver disease. A serum albumin of 2 gm. per cent or less is usually a sign of grave disease, and may occur in any diffuse liver involvement.

The gamma globulin is characteristically elevated in early and mild liver disease and may be the last abnormality to return to normal[21]. Unless fractionation of the globulin is done, this slight elevation of the gamma globulin may be missed. This mild hypergammaglobulinemia is almost universally present in diffuse liver disease and is therefore of no differential diagnostic value as to the

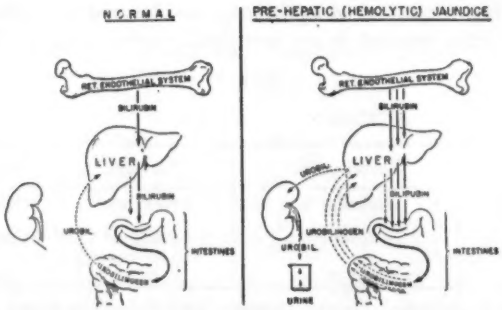


Fig. 1—Enterohepatic circulation of bile pigments. From Spellberg: *"Diseases of the Liver."* Grune & Stratton, New York 1954.

type of liver disease. Marked elevation of the globulins and especially the gamma globulin is characteristic of inflammatory liver disease. Thus hepatitis in the acute as well as the chronic stage will reveal a higher globulin than is seen in portal or nutritional cirrhosis. The gamma globulins may become especially high in postnecrotic (posthepatitic) cirrhosis. We observed one patient with this disease who had a total protein of 16 gm. of which the globulins were 15.5 gm. and the gamma globulin was 11 gm. per cent[22].

Flocculation and Turbidity Tests

The various flocculation tests, seven of which are listed in Table I, are dependent on the serum albumin and globulin alterations. Thus any of these tests when positive indicate a decrease in serum albumin and a rise in the gamma globulin. But these changes are not only quantitative but also qualitative. There is test tube evidence that the normal serum albumin, even in re-

duced concentration, will inhibit the cephalin cholesterol flocculation, while the albumin in a patient with infectious hepatitis is altered in quality and does not inhibit this flocculation reaction[16].

Similar observations have been made about the gamma globulin in relation to the thymol turbidity. A strongly positive thymol turbidity depends not only on a quantitative elevation but on a qualitative change in the gamma globulin. Nonhepatic hypergammaglobulinemia such as occurs in multiple myeloma is accompanied by a normal or only weakly positive thymol turbidity, while a similar hyperglobulinemia of infectious hepatitis is accompanied by a markedly elevated thymol turbidity. This positiveness of the thymol turbidity as related to the elevation of the gamma globulin varies in different types of liver diseases. An equivalent elevation of the gamma globulin in hepatitis gives a much stronger thymol turbidity than in portal cirrhosis. Therefore, a strongly positive thymol turbidity would indicate the presence of inflammatory liver disease, such as hepatitis or its sequelae, with marked mesenchymal exudative reaction.

TABLE III

GLUCOSE TOLERANCE IN PATIENT WITH CARCINOMA OF THE PANCREAS

Fasting Blood Sugar
162 to 243
NPH Insulin, 20 units daily

After Relief of Jaundice
65

I.V. Glucose Tolerance

77	Fast.
168	30 min.
144	60 min.
110	120 min.

While the quantitative and qualitative variations in the albumin and gamma globulin are the most important biochemical changes responsible for all the flocculation reactions, other factors influence them in a minor and variable degree. Physical factors such as temperature and ultraviolet light influence some of these reactions and may result in false positive reactions. These laboratory conditions must be standardized in performing the cephalin cholesterol flocculation test. Other globulins and lipids, or lipoproteins influence the thymol turbidity, and the zinc sulfate turbidity. In general, because of the unknown and slightly different factors involved in producing the flocculation in these various tests it is best to do more than one flocculation test. I prefer to combine the thymol test with the cephalin cholesterol flocculation. These are probably the best standardized and most widely used tests.

These flocculation tests have another virtue in the differential diagnosis of jaundice. In the presence of a posthepatic obstruction there appears to be a

serum factor which inhibits flocculation in spite of a depression of the serum albumin, elevation of the globulin and a marked exudative process in the liver.

Hyperprothrombinemia occurs in both hepatic and posthepatic (obstructive) jaundice. In the latter it is due to defective absorption of Vitamin K from the gut which responds promptly to parenteral Vitamin K. In parenchymatous damage hypoprothrombinemia becomes manifested in advanced liver disease and hence is of serious prognostic significance. The response to Vitamin K administration is negligible. I have seen significant and persistent elevation in the prothrombin time in patients with passive congestion of the liver.

Serum Lipid Alterations

It is pretty well established that the liver synthesizes cholesterol esters[7]. When the liver is impaired, cholesterol ester synthesis decreases and its value

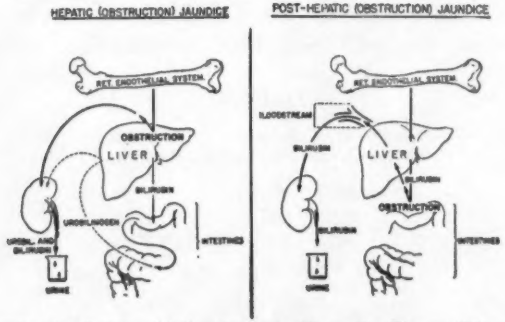


Fig. 2—Enterohepatic circulation of bile pigments. From Spellberg: *"Diseases of the Liver"*. Grune & Stratton New York, 1954.

in the blood is decreased. Normally the esterified cholesterol accounts for 65 to 75 per cent of the total cholesterol. With hepatocellular impairment the esters may drop markedly and may even completely disappear. A marked drop in cholesterol esters is not only indicative of hepatocellular damage but points to a poor prognosis. I have, however, seen patients with viral hepatitis recover in spite of 0-5 per cent cholesterol esters. A marked drop of cholesterol esters is of graver significance in chronic liver disease, such as portal cirrhosis, then in acute hepatitis.

A marked decrease in the total cholesterol as well as the cholesterol esters is indicative of grave prognosis. A decrease of both the total as well as esterified cholesterol is a more serious prognostic sign than a decrease of either alone. The rationale of this statement is derived from the observation that cholesterol ester synthesis is disturbed by early or slight hepatic damage, but interference with free cholesterol synthesis requires more severe and extensive damage.

The problem of cholesterol metabolism in liver disease will be discussed further below.

Defects in Carbohydrate Metabolism

The liver is the important organ in maintaining the homeostatic control of the blood sugar. When its function of glycogenesis or glycogenalysis is interfered with by defects in phosphorylation, alterations in the blood sugar or glucose tolerance test can occur. The classical example of disturbance of carbohydrate metabolism in liver disease is glycogen storage disease or von Gierke's disease. A defect in the hepatic glucose-6-phosphatase is the chief pathogenetic factor[4,18], in this disease.

The conversion of other hexoses into glucose by the liver is tested by the galactose tolerance test. There are oral and intravenous galactose tolerance tests. In the oral test 40 gm. of the sugar is administered by mouth and normally less than 3 gm. appear in the urine in 4 hours. The excretion of more than 3 gm.

TABLE IV

Hepatic Disease Accompanied by Elevated Alkaline Phosphatase

1. Metastatic neoplasms of liver.
2. Primary neoplasm of liver.
3. Liver abscess.
4. Granulomas of liver.
   a. Sarcoidosis
   b. Tuberculosis
   c. Brucellosis
5. Cholangiolytic hepatitis.
6. Intrahepatic cholangitis.
   a. Chemical
   b. Bacterial
7. Cholangiolytic or biliary cirrhosis.

is indicative of parenchymal damage, and has been used in the differential diagnosis of jaundice. The expense of the galactose and the need for quantitative urine collections impairs the usefulness of the test. The intravenous test eliminates the cost objection but introduces more technical problems[1].

The impairment of removal of glucose from the blood in liver disease makes the glucose tolerance test useful as a test of hepatic impairment. The intravenous glucose tolerance test is preferred by me. One-third of a gram of glucose per kilogram of body weight is administered intravenously and blood determinations for glucose are done at half-hourly intervals for 2 hours. In a normal individual the blood sugar returns to the fasting level within one hour. In patients with hepatic impairment the blood sugar may not return to fasting level for 1½ to 2 hours.

The following case is an example of the effect of hepatic disturbance on carbohydrate metabolism. A 68-year old Jewish female presented herself with intense painless jaundice. Liver function tests were indicative of posthepatic jaundice. In addition she had hyperglycemia and glycosuria, which had to be controlled by insulin administration. Surgery revealed the presence of a carcinoma of the pancreas with obstruction of the common bile duct. A choledochojejunostomy was performed. After the jaundice disappeared, the blood sugar returned to normal and the glucose tolerance was no longer diabetic (Table III). The conclusion is inescapable that the hepatic dysfunction during the period of jaundice resulted in a marked alteration of carbohydrate metabolism which was revealed by the glycosuria and hyperglycemia. The pancreatic carcinoma although still present did not produce a clinical picture of diabetes after the jaundice was alleviated.

TABLE V

PATIENT WITH COMMON DUCT OBSTRUCTION BY CARCINOMA OF PANCREAS

Date	Ser. Bil.	Alk. Phos.	Cholesterol/Esters
10/12	6.6 mg.	6.5 units	256/151
10/19	11.1 mg.	5.3 units	264/118
10/26	10.6 mg.	4.0 units	358/192
	CHOLEDOCHOJEJUNOSTOMY		
11/1	39.2 mg.	3.0 units	
11/7	16.8 mg.	3.8 units	
11/17	4.6 mg.	10.4 units	

CHOLINESTERASE

A decrease of cholinesterase has been noted in parenchymatous hepatic dysfunction and has been advised as a good test in the differential diagnosis of jaundice[26]. This view has been challenged by others[13]. It is not an easy test to perform and most clinical laboratories are not equipped to perform it.

BROMSULFALEIN TEST

The bromsulfalein excretion test is one of the most sensitive tests of chronic liver disease. It may be the only test positive in mild portal cirrhosis. It becomes positive in metastatic neoplasms of the liver. It is most useful in anicteric liver disease but can be used in the presence of jaundice. In mild icterus (3 mg. per cent or below) it may even be used to distinguish between icterus due to

biliary obstruction and parenchymal liver disease. If this mild degree of icterus is due to bile duct interference, the BSP excretion may be normal, however, when it is due to parenchymal damage the dye retention may be high.

It is evident from the above as well as other observations[14] that the BSP is a test of parenchymal function rather than bile duct potency. With the use of the table by Zieve[29], one can calculate the amount of BSP retention that can be attributed to bile duct obstruction in marked jaundice. When this amount is subtracted from the total BSP retention, it leaves the BSP retention attributable to parenchymal damage. Thus one can utilize the BSP test in determining parenchymal damage even in high grade obstruction.

Tests Indicative of Biliary Obstruction

In clinical medicine it is rare indeed that a jaundiced patient has only one etiologic cause for the jaundice. Usually the causes are multiple but they con-

TABLE VI

Serum Bilirubin, Alkaline Phosphatase, and Cholesterol in Patients with Biliary Cirrhosis

Patient	Bil. mg. %	Alk. Phosph. u	Chol.
FCW	14.6	100	416
	41.0	50	157
MM	5.4	70	832
	6.2	37	592
	6.4	91.8	576
NM	4.3	46.3	1850/150
	2.3	29.8	1330

tribute in varying degrees to the cause of the jaundice. The classical example is a patient with a hemolytic anemia whose jaundice may be a result of hemolysis (prehepatic jaundice) parenchymal damage (hepatic jaundice) and bile duct obstruction from biliary calculi. The jaundice at a given time may be due chiefly to one of these probable factors. It is the task of the physician to determine which one of these three possible causes is most important, and direct the therapeutic program toward it. The stool and urine pigment content is of great help in this respect, but the clinical factors are usually most impelling.

Serum Bilirubin

In the mammalian organism about 90 per cent of bilirubin is formed outside of the liver, but it is normally entirely excreted by the liver. It is not sur-

prising therefore that markedly elevated serum bilirubin is regarded as a sign of interference with the biliary ducts. Since the parenchymal and Kupffer cells have to transfer the bilirubin from the blood into the bile canaliculi, elevated serum bilirubin may likewise be due to hepatocellular damage. But even in hepatocellular damage there is invariably intrahepatic bile duct obstruction.

There is more than one type of bilirubin, at least two and perhaps three types have been recognized. This difference is probably due to the different prostatic groups to which the pigment is attached. This may be a protein or a metal[17].

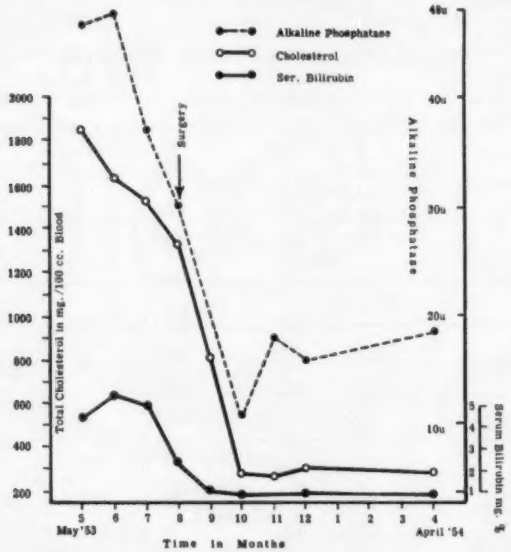


Fig. 3—Serum cholesterol, bilirubin, and alkaline phosphatase in patient with xanthomatous biliary cirrhosis. Note lack of correlation between these factors in last part of graph. From Spellberg & Gattas.

The 1-minute or direct reacting bilirubin as distinguished by the van den Bergh reaction is formed in the bile ducts and therefore is the one which shows the greatest rise in biliary duct obstruction.

Serum Alkaline Phosphatase

A markedly elevated serum bilirubin, predominantly of the 1-minute type and a high serum alkaline phosphatase are signs of posthepatic (surgical jaundice. An alkaline phophatase of over 10 Bodansky units is due to post-hepatic jaundice in 80 per cent of cases. The other 20 per cent of markedly elevated alkaline phosphatase occur in hepatic disease such as intrahepatic

cholangitis, biliary cirrhosis, cholangeolytic hepatitis and infiltrative lesions of the liver, especially metastatic malignancies (Table IV). In invasion of the liver by malignant tumors the alkaline phosphatase may be elevated in the presence of a normal bilirubin (Fig. 4).

The diagnostic absolutism of a markedly alkaline phosphatase in posthepatic jaundice is not only impaired by the 20 per cent of cases that are due to other causes but also by the low values seen in our case of complete obstruction of the common duct (Table V). The diagnostic significance of a markedly elevated alkaline phosphatase can be stated in another way: 1. it is usually (80 per cent) due to posthepatic jaundice, 2. in 20 per cent of instances it is caused by intrahepatic disease and 3. in a small percentage (5 to 10 per cent) of posthepatic jaundice the alkaline phosphatase is only slightly elevated.

TABLE VII

Ca Pancreas Male Age 48

		Ser. Bil.	Alk. Phosp.
7-29-53		12.2 mg.	13.4 u
	Cortisone		
8-3-53		10.4	12.1
8-12-53		6.0	24.3
8-15-53		4.0	32.5
8-24-53		3.3	32.2
8-29-53		1.9	21.2
9-11		1.2	43.0

This variability of the elevated alkaline phosphatase should make the clinician ask the question: What is the cause of an elevated alkaline phosphatase in liver disease?

The normal serum alkaline phosphatase probably originates chiefly in osteoblasts. A great deal of alkaline phosphatase, however, is found in the intestinal mucosa, in the kidneys and liver[15]. It is more than likely that the alkaline phosphatase in these tissues originates there and is not of osseus origin. The liver of course excretes alkaline phosphatase in the bile. Serum alkaline phosphatase is elevated in diseases of two organs: the skeleton and the liver. The elevation of the alkaline phosphatase in liver disease may be due to the following:

1. Impaired excretion of alkaline phosphatase of osseus origin.
2. Increased elaboration of alkaline phosphatase by the liver and

3. A combination of both factors 1 and 2.

There is no doubt that alkaline phosphatase is excreted in the bile and in dogs Freeman and Chen[6] found that about 250 units are excreted in 24 hours, so that if this loss were blocked by bile duct obstruction there would be a rise in the serum content of this enzyme. But if the liver would act as a passive pathway for loss of alkaline phosphatase one would expect its accumulation in the blood to parallel that of serum bilirubin but this is not the case (Tables V, VI and VII, Fig. 3). In complete obstruction of the bile duct by a tumor of the pancreas the alkaline phosphatase should rise markedly, but as seen in Table V, the rise may be slight. While in incomplete intrahepatic obstruction, with only mild hyperbilirubinemia the rise may be marked (Table VI, Fig. 3), in completely anicteric patients with metastatic carcinoma to the liver the alkaline phosphatase may be high (Fig. 4). Likewise in severe hepatitis with

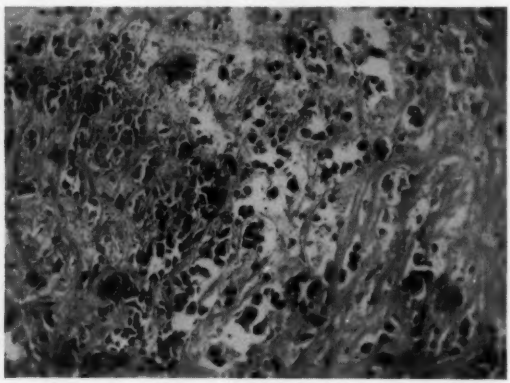


Fig. 4—Needle liver biopsy, showing metastatic carcinoma. Serum bilirubin normal, alkaline phosphatase 12.3 u (Bodansky) BSP retention 12 per cent. From Spellberg: "*Diseases of the Liver*". Grune & Stratton, New York, 1954.

marked hyperbilirubinemia, and acholic stools the serum alkaline phosphatase may be only moderately elevated. Moreover in such instance the alkaline phosphatase may drop as the serum bilirubin goes up.

These discrepancies can be resolved if we accept the second theory, that the liver synthesizes alkaline phosphatase as well as excretes it. In certain types of liver disease there is increased synthesis of alkaline phosphatase and therefore its accumulation in the blood is not dependent on biliary obstruction. That is why hyperalkalinephatasemia can be present without hyperbilirubinemia and may rise while the bilirubin is falling. In severe hepatocellular disease the alkaline phosphatase is low and may fall in spite of a rising bilirubin. This combination of rising serum bilirubin and falling alkaline phosphatase is indicative of a very poor prognosis. The failing liver cannot elaborate alkaline phosphatase.

Experimental evidence is also available pointing to elaboration of alkaline phosphatase by the liver. The liver is a very important organ in carbohydrate metabolism. Alkaline phosphatase is important in phosphorylation of glucose in the kidney and intestines as well as the liver[15]. Administration of dextrose and other manipulation of diet results in a rise in alkaline phosphatase[2b,25]. A marked immediate decrease of serum alkaline phosphatase occurs in rats after bile duct ligation; a rise occurs later when new bile ducts have formed[27]. This suggests that the newly formed bile ducts are responsible for synthesis of alkaline phosphatase. Dogs maintained on a low protein diet for 8 weeks show a rise of alkaline phosphatase but no jaundice. The addition of protein to the diet results in a return of the alkaline phosphatase to normal[11]. Intravenous injection of gum

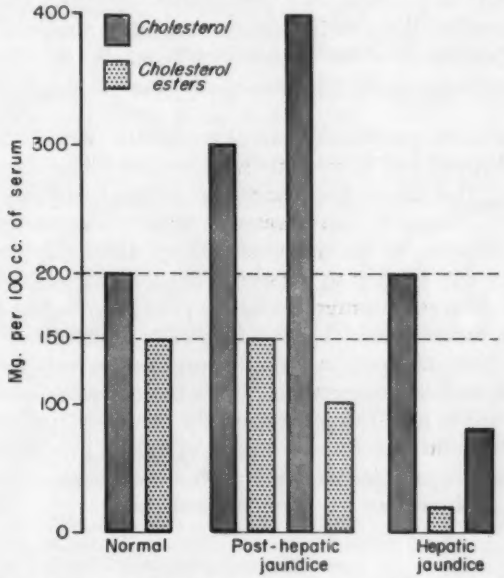


Fig. 5—Serum cholesterol and cholesterol esters in various types of jaundice.

acacia likewise produces a rise of serum alkaline phosphatase[2a]. Hepatectomy results in no elevation of alkaline phosphatase, while partial hepatectomy results in elevation of liver phosphatase followed by elevation of serum phosphatase. Ligation of one hepatic duct results in elevation of alkaline phosphatase without hyperbilirubinemia. Newly formed regenerating liver cells show a heavy concentration of alkaline phosphatase by bisto-clinical technics[24].

These clinical as well as the experimental observations offer abundant evidence that the liver not only excretes but synthesizes alkaline phosphatase, and under certain conditions an elevated alkaline phosphatase may be due entirely to hepatic overproduction of this enzyme.

Cholesterol

The problem of the significance of the free or unesterified serum cholesterol is similar to that of the alkaline phosphatase. Cholesterol is excreted in the bile, synthesized by the liver from acetate, and converted by the liver into bile acids[19]. It is evident from recent studies with radioactive carbon-labeled acetate that the liver is the chief source of the plasma cholesterol[8,12]. When the common duct of a dog is obstructed experimentally the free cholesterol rises from 12 mg. per cent to 225 mg. per cent in 48 hours. The cholesterol ester values remain the same[3], and consequently the *percentage* of cholesterol esters drop from about 80 to less than 20 per cent. This must be remembered when analyzing cholesterol values in patients with posthepatic jaundice. The total or free-cholesterol rises while the esterified cholesterol may remain the same, and if expressed as a percentage of the total it may be much less than the normal 70 per cent and therefore can be erroneously construed as a sign of liver damage.

Figure 5 presents graphically the characteristic serum cholesterol values in a normal individual and in patients with hepatocellular damage and biliary duct obstruction. The rise in free cholesterol occurs frequently but not invariably in posthepatic jaundice. The increase of serum cholesterol does not parallel the degree, or duration of the impaired biliary drainage. The rise of serum cholesterol is not due entirely to impaired excretion but also to increased synthesis as well as decreased destruction by the liver. The highest levels of cholesterol are seen in xanthomatous biliary cirrhosis in which there is mild impairment of the intrahepatic ducts and the icterus may be only mild[23] (Table VI, Fig. 3). When liver failure supervenes the serum cholesterol decreases because of the inability of the liver to synthesize it. In the severe jaundice and marked intrahepatic biliary obstruction seen in cases of diffuse liver necrosis the cholesterol is low. In posthepatic jaundice the cholesterol decreases when severe liver damage occurs. Such patients are poor surgical risks.

Summary

Liver function tests are useful in the diagnosis and differential diagnosis of liver disease. The flocculation tests and serum protein partition are useful indices of hepatocellular damage. It is emphasized that alkaline phosphatase and cholesterol is elaborated as well as excreted by the liver. The rise and fall of these substances in the blood are dependent on the functional integrity of the liver as well as on the potency of the biliary ducts. Because of this the serum alkaline phosphatase and cholesterol are of prognostic as well as diagnostic value.

REFERENCES

1a. Althausen, T. L.: Liver Function Tests in the Differential Diagnosis of Jaundice. Am. J. Med. **4**:208, 1948.

1b. Althausen, T. L. and Wever, G. K.: Galactose Tolerance in Hyperthyroidism. J. Clin. Invest. **16**:257, 1937.
2a. Bodansky, A.: Non-Osseous Origin of Serum Phosphatase. Proc. Soc. Exper. Biol. & Med. **42**:800, 1935.
2b. Bodansky, A.: Phosphatase Studies. VI Non-Osseous Origin of Serum Phosphatase. Its Increase after Ingestion of Carbohydrates. J. Biol. Chem. **104**:473, 1934.
3. Byers, S. O., Friedman, M. and Michaelis, F.: Source of Excess Plasma Cholesterol after Ligation of Bile Duct. J. Biol. Chem. **188**:637, 1951.
4. Cori, G. T. and Cori, C. F.: Glucose-6-phosphatase of the Liver in Glycogen Storage Disease. J. Biol. Chem. **199**:661, 1952.
5. Foley, E. F., Keeton, R. W., Kendrick, D. B. and Darling, G. D.: Alterations in Serum Proteins as an Index of Liver Failure. Proc. Soc. Exper. Biol. & Med. **33**:430, 1935.
6. Freeman, S. and Chen, Y. P.: The effect of Jaundiced Blood Upon Normal Dogs with Special Reference to the Serum Phosphatase. J. Biol. Chem. **123**:239, 1938.
7. Friedman, M. and Byers, S. O.: Observations Concerning the Production and Excretion of Cholesterol in Mammals. J. Clin. Invest., **34**:1369, 1955.
8. Gould, R. G., Leroy, G. V., Okita, G. T., Kabara, J. J., Keegan, P. and Bergenstal, D. M.: The Use of C^{14} Labeled Acetate to Study Cholesterol Metabolism in Man. J. Lab. & Clin. Med. **46**:372, 1955.
9. Gray, S. J. and Barrah, E. S. G.: The Electrophoretic Analysis of the Serum Proteins in Diseases of the Liver. J. Clin. Invest. **22**:191, 1943.
10. Greene, C. H., Shattuck, H. F. and Kaplowitz, L.: J. Clin. Invest. **13**:1079, 1934.
11. Hough, V. H. and Freeman, S.: The Effect of a Protein Deficient Diet on the Serum Phosphatase & Hepatic Dye Clearance of Dogs. Am. J. Physiol. **138**:184, 1942.
12. Leroy, G. V.: Studies of Cholesterol Synthesis in Man Using Carbon^{14} Labeled Acetate. Ann. Int. Med. **44**:524, 1956.
13. Mann, J. D., Madel, W. I., Eichman, P. L., Knowlton, A. and Sborov, V. M.: Serum Cholinesterase Activity in Liver Disease. J. Lab. & Clin. Med. **39**:543, 1952.
14. Mendeloff, A. I., Kramer, P., Ingelfinger, F. J. and Bradley, S. E.: Studies with Bromsulfalein. Gastroenterology **13**:222, 1949.
15. Moog, F.: The Physiological Significance of the Phosphomono esterases. Biol. Rev. **21**:41, 1946.
16. Moore, D. B., Pierson, P. S., Hanger, F. M. and Moore, D. H.: Mechanism of the Positive Cephalin Cholesterol Flocculation Test in Hepatitis. J. Clin. Invest. **24**:292, 1945.
17. Najjar, V. A.: The Metabolism of Bilirubin. Pediatrics **10**:1, 1952.
18. Recant, L.: Recent Developments in the Field of Glycogen Metabolism and the Diseases of Glycogen Storage. Am. J. Med. **19**:610, 1955.
19. Siperstein, M. D., and Murray, A. W.: Cholesterol Metabolism in Man. J. Clin. Invest. **34**:1449, 1955.
20. Spellberg, M. A.: Diseases of the Liver. Grune and Stratton, New York, 1954.
21. Spellberg, M. A., Cohn, C., Wolfson, W. Q. and Shore, C.: Serum Globulin Fractions as an Index of Hepatic Dysfunction. Gastroenterology **14**:11, 1950.
22. Spellberg, M. A. and Cunningham, Wm.: Postnecrotic Cirrhosis with Marked Hyperglobulinemia and Strangely Positive LE Phenomenon. Proc. Am. Gastroenterological Assoc. 27, 28 April 1956, Atlantic City, N. J.
23. Spellberg, M. A. and Gattas, F. A.: Xanthomatous Biliary Cirrhosis in the Male. A Report of Two Cases with Biochemical Improvement in One After Oral Exploratory Laparotomy. Gastroenterology, **28**:216, 1955.
24. Stowell, R. E. and Lee, C. S.: Histochemical Studies of Mouse Liver after Single Feeding of Carbon tetrachloride. Arch. Path. **50**:519, 1950.
25. Tuba, J., Siluch, K. A., Robinson, M. I. and Madsen, N. B.: Relationship of Dietary Factors to Rat Serum Alkaline Phosphatase. Canad. J. M. Sc. **30**:515, 1952.
26. Vorhaus, L. J., Scudamore, H. H. and Kark, R.: Measurement of Serum Cholinesterase Activity in the Study of Diseases of the Liver and Biliary System. Gastroenterology **15**: 304, 1950.
27. Weil, L. and Russell, M. A.: Studies on Plasma Phosphatase Activity on Blood Phospholipids in Rats with Obstructive Jaundice. J. Biol. Chem. **144**:307, 1942.
28. Wiener, H. J. and Wiener, R. E.: Plasma Protein. Arch. Int. Med. **46**:236, 1930.

29. Zieve, L., Hanson, M. and Hill, E.: Studies of Liver Function Tests: II Derivation of a Correction Allowing Use of the Bromsulfalein Test in Jaundiced Patients. J. Lab. & Clin. Med. **37**:40, 1951.

Discussion

Dr. I. Snapper:—The cephalin flocculation test has decidedly a very important diagnostic value. If this reaction is positive, then a degenerative disease of the liver is present. The negative result is of very little importance because a negative result may also be obtained in patients who have a diseased liver.

The alkaline phosphatase content of the serum is also of great importance. A normal alkaline phosphatase content of the serum practically excludes the presence of an extrahepatic obstruction. An increase of the alkaline phosphatase, however, has little clinical value. It is not only present in extrahepatic obstruction but also in intrahepatic obstruction as in a cholangiolitic hepatitis. Moreover, it is found in liver cirrhosis—with or without jaundice—due to the proliferation of the cholangioles and in patients with a bone disease with proliferation of the osteoblasts.

In summary then, a *positive cephalin flocculation test* and the *absence of an increased alkaline phosphatase* of the serum can both be used for differential diagnostic purposes. A negative cephalin flocculation does not prove the absence of liver degeneration and an increased alkaline phosphatase of the serum does not prove the presence of extrahepatic biliary duct obstruction.

The determination of the albumin/globulin content, and especially of the gamma globulin content, of the serum may lead to valuable diagnostic conclusions. If a patient has hepatitis and either the globulin content or the gamma globulin content of the serum rises, then the patient is a candidate for a post-necrotic liver cirrhosis.

The galactose test is an excellent test in hepatitis. It indicates liver dysfunction, but only in the first two weeks of the disease. In the later stages of hepatitis the outcome of the galactose test is unreliable.

I would like to hear Dr. Spellberg's opinion about the following points:

Does he agree that the absence of urobilinogen in the urine during jaundice proves the presence of a complete extrahepatic obstruction which is usually cancerous in nature?

Is Dr. Spellberg of the opinion that even in a complete extrahepatic obstruction, urobilinogen may appear in the urine? In severe obstructive icterus the enteric juices allegedly become jaundiced so that in this roundabout way bilirubin may reach the intestinal lumen and be reduced to urobilinogen.

Dr. Spellberg:—I do think that the concept of the qualitative absence of urobilinogen in the stool in most patients with malignant obstruction of the

common duct is correct. When one uses quantitative methods, there may be 5 mg. of urobilinogen or more in the 24-hour stool. This, however, is insufficient to give a positive qualitative reaction. So perhaps, this small quantity of urobilinogen may come partly or wholly from leakage bilirubin through the mucosa of the gastrointestinal tract.

In rare instances bilirubin may be converted to urobilinogen in the liver and extrahepatic bile ducts when these are the seat of a bacterial infection.

The semiquantitative urinary urobilinogen determination with Ehrlich's diazo reagent is a very simple and rapid method in assaying the presence of this pigment in the urine and can be done in the office or even at the patient's bedside. The quantitative 24-hour urine urobilinogen requires collection and storage of the urine and more elaborate chemical procedure.

ROENTGEN STUDIES OF THE BILIARY TRACT
AN EVALUATION OF RECENT CONTRIBUTIONS*

WILLIAM H. SHEHADI, M.D.

New York, N. Y.

For approximately a quarter of a century, roentgen visualization of the biliary tract, in the intact subject, was limited to the gallbladder. Consequently from a clinical-roentgenological point of view our thinking has been conditioned, in a sense, primarily towards the gallbladder. The contrast media then in use contained two iodine atoms in the molecule, tetraiodophenolthalein used in the pioneer work of Graham and Cole (1924-1925)[5], later superseded by Priodax (1940)[2].

The past few years have witnessed the replacement of these two iodinated contrast media by multi-iodinated molecular compounds,[1,3,4,6,8-14] and, from a clinical-roentgenological aspect, a change in concept or point of view from the restricted realm of the gallbladder to that of the biliary tract as a whole, from cholecystography to cholecystocholangiography, both oral and intravenous. A reevaluation of technics, contrast media and criteria are therefore quite timely.

This becomes all the more important when we bear in mind the fact that we are often unable to distinguish clinically between the signs and symptoms of disease primarily involving the gallbladder and that primarily involving the bile ducts. All the more striking is the frequency with which patients return following cholecystectomy, suffering from the same symptoms which first brought them to the physician, irrespective of whether or not the gallbladder was diseased. To this condition, the all too abused and misleading label of "postcholecystectomy syndrome" has been applied.

By means of oral and intravenous cholangiography, the bile ducts are visualized in their "undisturbed" state. No examination of the biliary tract can be considered complete unless the gallbladder and the major bile ducts have been adequately visualized. Our objective should be to study their anatomy and physiology, to determine the presence, if any, of developmental anomalies, and to demonstrate and fully evaluate any pathological changes in the gallbladder and bile ducts. The examination should be conducted with the intention of evaluating the biliary tract as one unit. The procedure should utilize intravenous and oral cholangiography to their utmost usefulness rather than be based on a preference or selection of the oral vs. the intravenous method of examination. By using Telepaque orally and Cholografin methylglucamine intravenously, separately or in sequence, the gallbladder and the bile ducts should be suffi-

*Presented before the Course in Postgraduate Gastroenterology of the American College of Gastroenterology, New York, N. Y. 18, 19, 20 October 1956.

ciently visualized so as to permit an adequate survey and a full evaluation of their status.

Contrast Media and Methods of Use

Oral Method:—1. Telepaque* was introduced in 1949[10], and has the advantage of low toxicity, minimal side reactions, and excellent gallbladder and bile duct visualization.

When Telepaque is used, the gallbladder is visualized in about 80 per cent of cases. Following oral administration of a fat meal, the bile ducts along the outflow path, the cystic duct and common bile duct, are opacified in 80-85 per cent of cases in which the gallbladder has been visualized. Such visualization

Fig. 1—Twelve hours after oral administration of 3 gm. of Telepaque. Ten minutes after a fat meal with prompt response of a normal functioning gallbladder. Initial reflux into hepatic duct due to delayed relaxation (spasm) of the sphincter of Oddi. Subsequent films showed good emptying of the gallbladder and ducts.

Note: Normal caliber of the ducts, small amount of Telepaque in the duodenum.

is best obtained in from 10-15 minutes after oral administration of the fat meal. The hepatic ducts are visualized by reflux, if there is distal obstruction. If this condition is temporary, as in spasm of the sphincter of Oddi (Fig. 1), the caliber of the hepatic ducts remains normal. If, however, the obstruction is long-standing because of calculi, intrinsic tumors in the common ducts, adhesions, stenosis of the sphincter of Oddi, or extrinsic pressure due to pancreatic or other tumors, the caliber of the ducts will be increased[11].

2. Teridax† was introduced after Telepaque, superseding Priodax and is definitely superior to the latter, but far less satisfactory than Telepaque. Teridax

*Product of Winthrop Laboratories, Inc.
†Product of Schering, U. S. A.

has a higher incidence of side reactions, bile duct visualization is less frequent and less satisfactory. The density of the gallbladder shadow is also less pronounced and less satisfactory.

Intravenous Method:—Recently a series of compounds of the iodipamide group with six iodinated molecules for intravenous cholecystography, have been introduced in succession (Fig. 5—sodium-1952, lithium-1953 and methylglucamine-1954).

Fig. 2—A 50-year old white female, cholecystectomy 15 years prior. Patient is asymptomatic at this time. Routine check-up.

Thirty minutes after injection of 20 c.c. Cholografin methylglucamine (52 per cent) normal hepatic and common bile ducts.

Note: Copious flow of the contrast medium into the duodenum.

Because of the high iodine content, they present a reliable method for rapid visualization of the biliary tract irrespective of whether or not the gallbladder is present and independent of its ability to concentrate its contents. These compounds have essentially the same indications and contraindications excepting that our choice favors the compound which gives superior visualization and the lowest incidence of side reactions.

1. Cholografin‡ (Biligrafin§)[1,3,4,8,9,13], the first of the series, is a 20 per cent solution of sodium iodipamide, is dispensed in 20 c.c. ampules with a companion 1 c.c. ampule to test the patient's sensitivity. The optimal dose is 40 c.c.

2. Lithium salt[16], 40 per cent solution dispensed in 20 c.c. ampules, with a companion 1 c.c. test ampule. Its chief advantage of greater ease of administration due to smaller volume of required dose is outweighed by its high toxicity. This product has been withdrawn.

3. Cholografin methylglucamine‡ (Biligrafin Forte§)[14]–This is a 52 per cent solution of methylglucamine iodipamide, recently introduced, which has superseded Cholografin. It is available in 20 c.c. ampules which is the optimal dose. A companion 1 c.c. ampule for sensitivity testing is in the same package.

Cholografin methylglucamine has the advantage over its two predecessors of greater ease of administration due to smaller required dosage, lower toxicity, and not infrequently improved biliary tract visualization.

When injected intravenously, Cholografin methylglucamine is promptly excreted by the liver with the bile. The hepatic and common ducts are well visualized within 10-20 minutes in about 90 per cent of cases and remain opacified through a period of about 60 minutes. Optimal visualization of the ducts occurs at 30-40 minutes. At times, the cystic duct is inadequately visualized. The gallbladder may be visualized as early as 20-30 minutes after injection, but often requires 2-2½ hours.

The best results are obtained after preparation of the patient in accordance with instructions listed in Table I.

Whenever the gallbladder is present, we recommend a fat-containing meal to be given the evening before the examination, irrespective of whether the examination is by the oral or intravenous method. This brings about satisfactory biliary drainage and in our experience, a higher incidence of gallbladder visualization. Furthermore, the presence of suspected gallbladder disease is no contraindication to the administration of such a fat meal.

4. Recently Schering, A. G., Berlin[16] and E. R. Squibb[15], New York, have made SH332 available for simultaneous cholecystocholangiography and urography. It is the methylglucamine salt of Renografin, 40 per cent and Cholografin, 20 per cent, in aqueous solution, dispensed in 20 c.c. ampules. The optimal dose is 40 c.c. Simultaneous renal and hepatic excretion follow the intravenous injection of this medium and result in prompt visualization of the urinary and biliary tracts. Examination of the urinary tract, performed in the usual manner,

‡Products of E. R. Squibb, New York.
§Product of Schering, A. G., Berlin.

is completed within 20-30 minutes. Examination of the biliary tract is, likewise, conducted in the usual manner. Optimal bile duct opacification occurs at 30-40 minutes and gallbladder visualization reaches its peak at about 2-2½ hours.

Our experience with this special preparation is still limited. It serves as a satisfactory method for routine investigation of both the urinary and biliary

TABLE I

INSTRUCTIONS TO THE PATIENT

A. *Preparation for Oral Examination of the Biliary Tract*
(Bile Ducts and Gallbladder)

1. On the evening prior to x-ray examination, eat a light supper such as lean meat, fresh vegetables, fruit, or fruit juice, toast or bread with jelly, coffee or tea. Avoid cooked fatty foods, but should have simple fatty foods including milk, cream, butter, eggs. Omit fried foods.
2. Eat nothing after the evening meal. Water, however, may be taken in moderate amounts until bedtime.
3. After supper at about 9 o'clock swallow the Telepaque tablets, one at a time with water.
4. On the following morning omit breakfast and report for x-ray examination at 8:45 A.M.
5. Do not take a laxative.

B. *Preparation for Intravenous Examination of the Biliary Tract*
(Bile Ducts and Gallbladder)

1. Have a light supper the night preceding the x-ray examination. If the gallbladder is present, the supper should consist of lean meat, fresh vegetables, fruit or fruit juice, toast or bread with jelly, coffee or tea. Avoid cooked fatty foods, but should have simple fatty foods including milk, cream, butter, eggs. Omit fried foods.
2. Take 1 oz. (2 tablespoonsful) of castor oil at 8 P.M.
3. Do not take any fluids after 10 P.M., the night preceding the examination.
4. Omit breakfast and report to the X-ray Department at 8:45 A.M.
5. If x-ray examination is scheduled for a later hour of the day, then take one-half cup of coffee or tea, a piece of toast with butter and jelly, and nothing else by mouth until after the x-ray examination has been completed.

tracts, but the clinical indications for such routine examinations are limited. Further experience and a larger series are necessary before we can adequately evaluate this method.

SPECIAL CONSIDERATIONS

Gallbladder function:—The function of the gallbladder is best determined when the oral method is used. This enables us to evaluate the ability of the gallbladder mucosa to absorb water and concentrate its contents. Furthermore,

when in response to a fat meal, the gallbladder contracts, the outflow path—cystic and common bile ducts, are better visualized with the concentrated Telepaque-laden bile, with its high iodine content, than with the intravenous method.

On the other hand, the hepatic ducts, the bile ducts in the patients with no gallbladder visualization and the bile ducts in the cholecystectomized patients cannot be adequately and consistently visualized with the oral method. The intravenous method results in rapid excretion by the liver. The initial high iodine content of the bile will permit immediate visualization with excellent anatomical delineation of the biliary tract, filling the gap where the oral method has failed or proved inadequate. Noteworthy is the fact that the gallbladder fills rapidly. Because, however, of the very nature and technic of this examina-

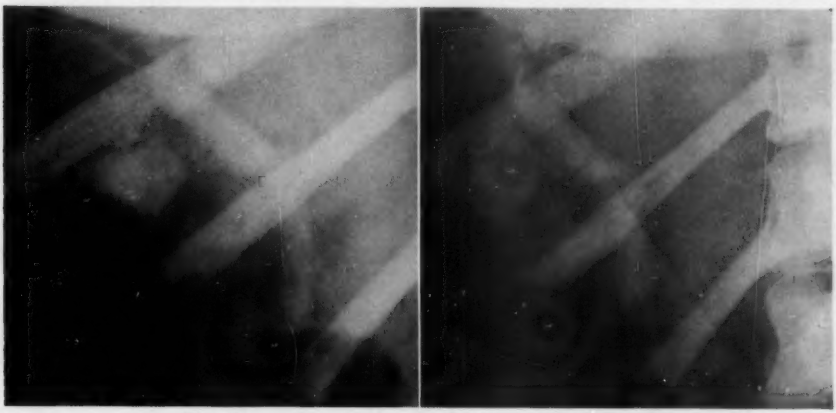


Fig. 3a Fig. 3b

Fig. 3—A 50-year old male, cholecystectomy five years prior. Slightly dilated hepatic and common bile ducts. Residual stump of cystic duct which is normal in caliber. So-called reformed gallbladder (arrow). (a) films made 30 minutes after injection of 20 c.c. Cholografin methylglucamine 52 per cent (b) 50 minutes after injection.

Note: Copious flow of the contrast medium into the duodenum.

tion, it will not adequately concentrate its contents as is the case with the oral method. In response to a fat meal, the ability of the gallbladder to contract and empty its contents can be adequately tested, but its ability to concentrate its contents cannot be reliably evaluated.

In cholecystectomized patients without the use of any adjuvant medication, the hepatic and common ducts have been visualized in 30-40 per cent of cases when using Telepaque and in 90 per cent of cases when using Cholografin methylglucamine. The gallbladder is frequently visualized with Cholografin methylglucamine when it fails to do so when orally administered media are used.

TABLE II

	Cholografin Biligrafin (Sodium Iodipamide) 20% Solution		Lithium Salt (Lithium Iodipamide) 40% Solution		Cholografin Methylglucamine Biligrafin Forte (Methylglucamine Iodipamide) 52% Solution	
	300 patients		50 patients		300 patients	
	No. of patients	% examined	No. of patients	% examined	No. of patients	% examined
Nausea	16	5.33	5	10.0	10	3.33
Vomiting	4	1.33	3	6.0	1	0.33
Sensation of heat	7	2.33	2	4.0	7	2.33
Flushing	9	3.00	1	2.0	4	1.33
Sensation of fainting	—	—	—	—	2	0.66
Itching	1	0.33	1	2.0	—	—
Headache	1	0.33	—	—	—	—
Pain in arm during injection	4	1.33	8	16.0	—	—
Chills	2	0.66	—	—	—	—
Temperature	1	0.33	—	—	—	—
Allergic reaction with marked drop in blood pressure	1	0.33	1	2.0	—	—
Diplopia (lasting 4 days)	—	—	1	2.0	—	—
Total side reactions	46	15.30	22	44.0	24	8.0

Comparison of side reactions in:

(a) 300 patients after injection of 40 c.c. Cholografin (Biligrafin) 20%
(b) 50 patients after injection of 20 c.c. Lithium Salt 40%
(c) 300 patients after injection of 20 c.c. Cholografin Methylglucamine (Biligrafin Forte) 52%

Excretion

Both Telepaque and Cholografin methylglucamine are eliminated principally by the intestinal tract; only 4 per cent and 10 per cent are excreted, respectively, by the urinary tract, hence absence of urinary tract irritation as compared with Priodax or Teridax. There is no evidence of absorption of the Cholografin group through the intestines, and only rarely is there reabsorption of Telepaque which results in occasional visualization of the gallbladder at 24 or 48 hours after the examination. In about 50 per cent of cases, simultaneous renal and hepatic excretion occur with apparent normal liver function and no decrease of density of the shadow of the biliary tract. In the presence of liver disease with accompanying impaired excretory function or obstruction, Cholografin methylglucamine is excreted by the kidneys and a urogram is obtained a few minutes after injection.

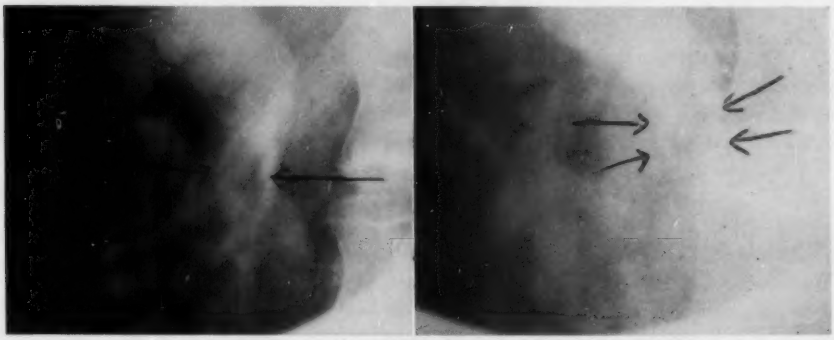


Fig. 4a Fig. 4b

Fig. 4—A 35-year old white female, cholecystectomy ten years prior. Slow filling of dilated hepatic and common bile ducts. Caliber 1.5–2.5 cm. Films made 60 minutes after injection of 20 c.c. Cholografin methylglucamine, 52 per cent.

Note: 1.5 cm. defect at the distal end of the common bile duct representing a partially impacted cholesterol calculus. (a) Right posterior oblique. (b) Right lateral view.

Side Reactions

The Cholografin-Biligrafin group produces a number of side reactions which, however, are far less pronounced than when other similarly administered media are used. Animal studies and observations on the human subject show a relatively low degree of toxicity. Severe side reactions are minimal, and to the best of our knowledge, no deaths have been reported (Table II).

As is the case with other intravenously administered contrast media, the use of the so-called preliminary sensitivity tests is unreliable in predicting the occurrence of side reactions.

The ocular, the intradermal and the intravenous tests are in use. The ocular is not without danger to the eye in case of a severe reaction. The intradermal and intravenous are the tests most frequently used. Many patients who show a positive reaction to either or both of the latter tests experience no side reactions whatsoever, while on many on whom the intradermal and intravenous tests were negative, side reactions of varying intensity were experienced[7,12,17].

A history of allergy or of any unfavorable reaction to a previous intravenously injected contrast medium calls for caution, but is not necessarily a contraindication. Premedication with antihistaminics (Benadryl or Chlortrimeton) may prove adequate. An emergency set, however, should be present in the radiographic room at all times. This should include sterile syringes and needles, Chlortrimeton or Benadryl, Ephedrine, 5 per cent sterile glucose solutions and an oxygen tank. The physician giving the injection should remain with the patient for some time after the injection and should be within easy reach at least until the examination has been completed.

The experience gained to date indicates that the media used for intravenous cholangiography, especially the methylglucamine salts, are quite safe. All the same, vigilance should be maintained until a larger series of cases has been accumulated with absolute proof of absence of death or of serious consequences.

Ducts

There is no evidence to support the contention that a physiological compensatory dilatation of the bile ducts occurs after cholecystectomy. If such were a requirement of nature, dilatation of the bile ducts would be universal and ducts of normal caliber would not be found in the cholecystectomized patient. The normal caliber of common hepatic and common bile ducts is 0.5-0.6 cm. (Fig. 2). The caliber of the cystic duct is 0.2 and 0.3 cm. Any deviation from these measurements is abnormal, the cause of which should be investigated and determined[11,12].

The increased intraductal pressure due to obstruction in the distal common duct will result in progressive dilatation of the common bile and the common hepatic duct. In 100 noncholecystectomized patients, the ducts were normal in 80 per cent and moderately to markedly dilated in 20 per cent. In 100 cholecystectomized patients, normal caliber of ducts occurred in 54 per cent and dilatation in 46 per cent.

The increased incidence of duct dilatation in the cholecystectomized patient is evidence of duct disease, primary or secondary and may signifiy, though too late, that the cholecystectomy was not necessary, that it did not cure the patient, and that the primary cause of the patient's symptoms was outside the gallbladder. One may, therefore, define postcholecystectomy syndrome as post-

operative and tardy recognition of a gradually progressing disease antedating the cholecystectomy[12].

According to our recent studies and to reports of other workers, the following are among the major causes of the so-called postcholecystectomy syndrome. Functional disturbances and inflammatory processes in the wall of the bile ducts, obstruction or delayed emptying due to disturbed drainage, may be due to intrinsic causes such as stenosis or calculi or extrinsic causes due to pancreatic

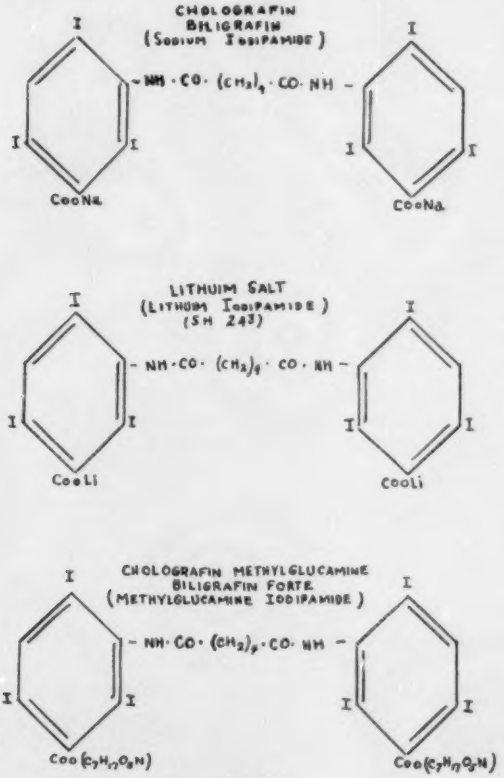


Fig. 5

disease or pressure by other tumors. None of these are relieved by cholecystectomy.

Truly, the only postoperative cause of the syndrome is residual cystic duct with or without calculus formation and postoperative calculus formation (Fig. 3). Even in the latter, the inciting cause may have already been active prior to operation.

Delayed Visualization of the Bile Ducts

Incomplete obstruction of the common bile duct, with concomittant delayed opacification of the ducts and delayed emptying into the duodenum, may be due to impacted calculi, compression or invasion by tumors, or stenosis of the sphincter of Oddi (Fig. 4). The absence of early biliary duct visualization, therefore, is not an indication of absence of hepatic excretion. Inspissated bile and bile pigment deposits in dilated ducts delay the flow and diffusion of bile and, consequently, of duct visualization. One or more hours may elapse before such opacification occurs. Delayed films should always be made. When, however, the common or hepatic bile ducts are severed due to trauma (stabwound or accidentally in surgery), bile duct visualization may be partial or absent.

Jaundice

Biliary tract visualization is consistently absent in obstructive jaundice, irrespective of its cause. On the other hand, in cases of hepatitis with hepatiocellular type of jaundice, biliary tract visualization is absent at the height of jaundice. As jaundice subsides faint visualization occurs, eventually becoming normal as the hepatic function returns to normal.

No reference has been made in this presentation to the use of medication producing spasm of the sphincter of Oddi, administered either before or during the examination. It is felt that false interpretations are likely to be made as a result of the spasm and accompanying duct dilatation, thus presenting abnormal factors for evaluation and masking already existing pathological findings. On the other hand, the use of antispasmodics may be quite helpful in the differential diagnosis between spasm and early stenosis or stricture.

Summary and Conclusion

Notwithstanding the relatively long interval of time elapsing between the administration of Telepaque in the evening and the examination of the patient the following morning, the routine oral method of examination of the biliary tract is time-saving, whereas the routine use of intravenous method is time consuming and places a heavy burden on an already over-burdened schedule of a busy office or Department of Radiology.

When the gallbladder is present (in the noncholecystectomized patient), the oral method using Telepaque should be used routinely.

On the other hand, the intravenous method should be used: 1. when the gallbladder fails to visualize after the use of an orally administered contrast medium; 2. in the cholecystectomized patient; 3. when there is disturbance of the function or there is disease of the gastrointestinal tract, interfering with absorption of orally administered medications; 4. when prompt biliary tract

evaluation is necessary in the differential diagnosis of acute condition, especially when surgery may be indicated.

The intravenous method should not be used in cases of severe liver or kidney disease as well as in obstructive jaundice. In subsiding jaundice, however, it may be of value in the differential diagnosis between jaundice due to hepatitis and obstructive jaundice by demonstrating the presence of calculi in the common bile ducts.

The procedure commonly used for testing the sensitivity of the patients for media used for intravenous cholecystocholangiography are unreliable in predicting the occurrence of side reactions. We stress the importance of constant watchfulness over the patient during and after the injection, and at least until the examination has been completed. An emergency set should be available in the radiographic room at all times. This should be an unbreakable rule.

Of the media investigated since 1949, superior results, minimal toxicity, and negligible to insignificant side reactions are obtained when Telepaque is used orally and Cholografin methylglucamine is administered intravenously.

The oral and intravenous methods of examination complement each other; neither method displaces or replaces the other.

REFERENCES

1. Batt, R. C.: Intravenous Cholecystocholangiography. Radiology, **65**:926-932, 1955.
2. Dohrn, M. and Diedrich, Paul: Deutsche Med. Wchnschr. **66**:1133, 1940.
3. Frommhold, W.: Ein neuartiges Kontrastmittel für die intravenöse Cholecystographie. Fortschr. Geb. Röntgenstrahlen, **79**:283-291, 1953.
4. Gaebel, E. and Teschendorf, W.: Darstellung der Gallenweg mit Biligrafin (Unblutige Cholangiographie) Röntgen Blatter, **6**:162-170, 1953.
5. Graham, E. A., et al: Cholecystography: Oral Administration of sodium tetraiodophenolphthalein. J.A.M.A. **85**:953-955, 1925.
6. Hornykiewytsch, T. and Stender, H. S.: Intravenöse Cholangiographie. Fortschr. Geb. Röntgenstrahlen, **79**:283-309, 1953.
7. McClenahan, J.: In discussion of paper by R. C. Batt, entitled Rapid Intravenous Cholecystography and Cholangiography. New York J. Med. **56**:1604, (15 May) 1956.
8. Milanes, F., Morales, L. M., Fernandez, O. L., Medrano, F. A. and Otero, F. C.: Colecisto-colangiografia con la Biligrafina Intravenosa. Archivos del Hospital Universitario, Habana, Cuba, **6**:13-28, (Jan.-Feb.), 1954.
9. Nemours-Auguste, and Barag, N.: La Cholangiocholecystographie intraveineuse opacification des voies biliaires intra-et extrahepatiques par une nouvelle substance. Presse Med., **61**:1244-1245, 1953.
10. Shehadi, W. H.: Telepaque, A New Cholecystographic Medium with Improved Visualization of the Gallbladder and Visualization of the Bile Ducts. Am. J. Roentgenol. **68**:360-368, (Sept.), 1952.
11. Shehadi, W. H.: Oral Cholangiography with Telepaque. Am. J. Roentgenol. **72**:436-451, (Sept.), 1954.
12. Shehadi, W. H.: Intravenous Cholecystocholangiography. J.A.M.A. **159**:1350-1353, 1955.
13. Shehadi, W. H.: Cholografin. A New Intravenously Administered Contrast Medium for the Visualization of the Gallbladder and Bile Ducts. Am. J. Roentgenol. **76**:7-20, 1956.
14. Shehadi, W. H. and Sablag, I.: Cholografin Methylglutamine. **1**:466-475, 1956.
15. Technical information supplied by Dr. Mark Lund, E. R. Squibb & Sons, New York, N. Y.
16. Technical information supplied by Dr. H. Meiler, Schering, A. G., West Berlin.
17. Theander, G.: Side-effects of Biligrafin. Acta Radiol. Scandinav. **43**:369, 1955.

Discussion

Dr. I. Snapper:—We must thank Dr. Shehadi for his excellent demonstration. A few points could perhaps be elucidated.

1. Did I understand correctly that all the gallbladders which did not visualize with Telepaque but could be visualized with Cholografin, were diseased?

2. I always pay careful attention to the result of a skin test performed with preparations used for visualization of gallbladder and biliary ducts. I wonder whether Dr. Shehadi would elaborate this point for us.

3. I must confess that in our patients with so-called postcholecystectomy syndrome, examined with Cholografin, only very rarely the presence of stones could be elicited. If in one of my patients after cholecystectomy for stones, later pains develop which cannot be attributed to any other disease, I advise operation, even if the Cholografin studies do not reveal the presence of stones, and occasionally in such cases stones proved to be present. In this connection, I wonder how large was the total number of cholecystectomized patients investigated by Dr. Shehadi with Cholografin and which percentage of these patients actually showed the presence of stones in the biliary ducts?

Dr. O. H. Wangensteen:—It was a privilege to have seen Dr. Shehadi's informative illustrations.

May I say one thing concerning Dr. Shehadi's remarks concerning the gallbladder which fails to be visualized on roentgen examination. I remember years ago when cholecystography was not as old as it is now, at one of the voluntary hospitals in our area a few surgeons were removing gallbladders quite routinely when a gallbladder shadow was not obtained on roentgen examination. The pathologist at one of these hospitals insisted that these were normal gallbladders. The surgeons went into a huddle and decided they needed a new pathologist. The discharge of the pathologist made the surgeons raise their sights a bit however on the indications for the removal of gallbladders. I believe there must be very few hospitals in this country now where a gallbladder will be removed because it fails to fill with the opaque medium on roentgen examination.

It might be proper to comment on some observations which I related at one of these sessions a year ago, which observations then seemed a bit novel. I indicated that we had come to the attitude of mind in patients undergoing cholecystectomy for gallstones to make a duodenotomy to examine the terminal ampulla. During the current year we have ascertained the sphincter resistance at the ampulla at operation by dripping saline solution into the common bile duct before making the duodenotomy. In the main, our observations suggest that, despite an atretic ampulla, which may not admit a 3 mm. probe, the resistance pressure encountered at the ampulla under anesthesia is within the normal range and is rarely found to be in excess of 120 mm. of saline solution.

On the basis of these observations one of my associates, Dr. Kamil Imamoglu, has placed a dicetylphosphate ligature lightly around the terminal common bile duct of dogs and rabbits and has succeeded in producing gallstones within the gallbladder. When Dr. Imamoglu succeeded in making an incomplete obstruction using this technic, the incidence of gallstone formation within the rabbits' gallbladders was very high. These observations give strong support to the mechanistic origin of gallstones.

The fundamental issue is: how does the narrowing at the ampulla come about? It must be an acquired character for otherwise gallstones would be found earlier in life. Is it the resultant effect of digestive juices plying over the duodenal side of the ampullary mucosa? Or is it the end effect of bile and pancreatic juice upon the mucosa within the ampulla? Or could an atretic ampulla represent essentially an hypertrophy of the circular muscle of the terminal bile duct as in cardiospasm?—a suggestion which I made a few years ago (*Ann. Surg.* **134**:318, 1951). The problem obviously is deserving of careful study. We have learned that the mucosa of the bile duct is equally as sensitive to injury by gastric juice as is the esophagus. This circumstance may provide some clues concerning the origins of the atretic ampulla.

Our distinguished Coordinator a few years ago kindly sent me a patient who needed to have his gallbladder removed. Moreover, he was good enough to come out to witness the operation. When I proposed doing a duodenotomy during the course of the cholecystectomy, Dr. Snapper's incredulity was easily communicated to me though he voiced no opposition. If the surgeon passes a small probe down the common bile duct through the amputated cystic duct, the probe ordinarily passes to the end of the duct without difficulty. I prefer, however, to raise the probe against the anterior duodenal wall without pushing it through the ampulla into the duodenal lumen, if there is the slightest suggestion of resistance. A short transverse incision is now made in the anterior duodenal wall and the ampulla comes immediately into view. The finding of an atretic ampulla which will not admit a 3 mm. probe has been frequent in patients who have gallstones. Let me stress the importance of making a short *transverse* incision in the duodenal wall. It can be closed readily, and without the problem of "dog ears" which regularly attends the use of the longitudinal duodenotomy incision [*Am. J. Gastroenterol.* **26**:284-289, (Sept.) 1956]. I suspect that some of Dr. Snapper's misgivings over duodenotomy related to prior observations of surgeons performing transverse closure of a longitudinal duodenotomy incision.

The finding of a pin-point opening at the ampulla in the presence of gallstones has not been unusual. In fact, in 60 per cent of our patients with gallstones a 3 mm. probe could not be passed into the duodenal lumen under direct vision without the addition of an incision over the probe to permit it to emerge into the duodenal lumen.

Thirty years ago (1926) I wanted to see what the effect was of placing human gallstones within the dog's gallbladder. Much to my surprise, they disappeared after a few weeks.

The only way I succeeded in producing stones in the dog's gallbladder was to place an attenuated streptococcal culture, which Dr. Benjamin Clausen was then growing on an agar medium, together with a wisp of gauze into the dog's gallbladder. Judd and Mann (*Surg., Gynec. & Obst.* **24**:437, 1917) indicated that removal of the gallbladder in dogs is followed by dilatation of the common bile duct—and so too in man. The Second Look operations for gastric cancer have afforded an excellent opportunity to check on the condition of the common bile duct. To do a complete removal of the potential lymphatic drainage area of the stomach for gastric cancer, it is often necessary to remove the gallbladder, in order to remove the lymph nodes in the cystic duct triangle. This is done at the time of the primary operation. In the second look operations in the lymph node positive cases this area is reinspected carefully. Removal of the gallbladder is not regularly followed by dilatation of the common bile duct. An atretic ampulla may be one of the causes of a dilated common bile duct after cholecystectomy.

In the main, sphincterotomy is a fairly effective remedy for biliary dyskinesia. One does not ordinarily perform sphincterotomy upon the duct of Wirsung. Long before sphincterotomy was being done commonly for biliary dyskinesia I had learned that the only effective way then available to rid the patient of this disorder, which followed cholecystectomy occasionally, was to put a T-tube into the duct and leave it there a long time. One should not leave the same tube in as I did initially for three years. When I then withdrew it, the rubber was badly disintegrated and encrusted with bile concrements. However, it came out intact. A straight tube of the same size was put in immediately and thereafter I replaced it once a month with a new tube. That patient, who had been operated upon four times previously because of recurrence of stones in the common bile duct, survived for 12 additional years following my operation and continued in good health. She never would hear of the tube being removed. At autopsy, the common bile duct was whistle clean! The long presence of the tube within the duct undoubtedly had succeeded in dilating it. This technic I employed successfully on several patients complaining of biliary dyskinesia before sphincterotomy came into vogue.

There is another observation I should like to make here: patients who have acute cholecystitis not uncommonly have an increased intraluminal pressure within the gallbladder. We have observed the intravesical pressure in a few instances at operation to be as high as 80 cm. of saline solution pressure—well above the capillary blood pressure. Necrosis and death of the gallbladder wall is understandable under these circumstances. One could use such measurements

justifiably, I think, as an indication for more frequent removal of the acute gallbladder by emergency cholecystectomy.

Dr. William H. Shehadi:—I appreciate the generous comments by both discussers. I shall try to answer the questions as best I can, and because of lack of time, as quickly as possible.

I would like to comment once again about nonvisualization of the gallbladder with Telepaque, and subsequent visualization with intravenously administered contrast media. We have often observed cases in which the gallbladder failed to visualize with telepaque, but filled readily with intravenous Cholografin or Cholografin methylglucamine administered either immediately or one or more days later. Routinely, in our department, in cases of failure of visualization with Telepaque, we complete the examination right then and there by following through with the intravenous injection rather than have the patient return on another day. Thus we save a great deal of time for all concerned, and a considerable amount of secretarial and technical detail which necessarily must be duplicated at the next visit.

A calculus temporarily impacted in the infundibulum or near the cystic duct, while the patient is in the usual sleeping position (right anterior oblique) for several hours during the night, will prevent the bile, and the Telepaque, from entering the gallbladder. When he wakes up, however, walks around, goes to the x-ray department, gets on the examining table in the supine position, the calculus may roll back into the fundus, away from the point of impaction, thus permitting the bile, and the contrast medium to enter into and visualize the gallbladder. We have had many cases illustrating how the calculus rolls back and forth in the gallbladder with change in position. In the absence of calculi there may be other elements which enter into this phenomenon and about which we are still ignorant.

The fact that the gallbladder is diseased does not mean it will not visualize. I believe this was amply demonstrated by some of the slides already presented. The fact that it visualizes though faintly, with or without calculi, presents a question that is up to you, the surgeon and the referring physician to determine. Guided by the clinical picture, you decide whether the case is for immediate surgery. As a radiologist I can say, to the best of my knowledge, that calculi are present or absent. Also, to the best of my knowledge, poor concentration in the gallbladder means poor absorption, an indication of disease. Poor emptying of the gallbladder usually indicates inability of the muscle to contract, another indication of disease of the gallbladder.

I hope I did not give the impression that we consider lightly the problem of allergy and the possibility of side reactions. We are fortunate to have behind us over 25 years of experience in intravenous urography. With this background we have had a much easier time with intravenous cholangiography than we

would have had we started this work some 30 years ago. When there is a history of allergy or of an unfavorable reaction to a previous intravenously injected contrast medium, we discuss the case with the referring physician. Often he is present with us at the time of examination. Premedication with an antihistaminic is the rule, and an emergency set, as previously mentioned, is always on hand, right in the radiographic room.

The point to be stressed is that when the intradermal and/or intravenous sensitivity tests are negative that does not mean the patient will not have a reaction. Conversely, if the sensitivity tests are positive that does not mean that the patient will have a reaction. Two of the most severe reactions we had in our series occurred in patients who were absolutely negative to the sensitivity tests, and who gave no history of allergy. In brief, we feel that any history of allergy or previous untoward reactions are a good indication for premedication with antihistaminics, but at all times we should be alert, cautious, and fully prepared to handle any reaction that may develop.

The third question amounts to this: did we miss any calculi in the bile ducts? Did we fail to demonstrate them preoperatively? Well, I can say: God only knows, but to the best of our knowledge every shadow which we have diagnosed as a calculus was verified at operation, and also to the best of our knowledge, the surgeon has not found any calculi when we indicated that there were none—a tribute to the great value of this method of examination.

I wish to stress one very significant point relative to this procedure, and that is that the examination should not be left in the hands of the technicians. At our institution I am nearby during the entire examination and I check every single film as soon as it is developed. If the scout film shows that the patient is not well prepared we cancel the examination, and the patient is sent for better preparation. If during the examination we are not satisfied with the position or the technical factors used these are corrected as the examination progresses. This insures the best results for good demonstration of the bile ducts, and the lowest incidence of missing calculi.

There are several more questions. I wish I could answer them now, but we are already behind time, and I offer my apologies to those who asked the remaining questions. I will be happy to see them privately after the meeting.

MANAGEMENT OF OBSTRUCTIVE JAUNDICE*

JULIAN A. STERLING, M.D., Sc.D., F.A.C.S., F.A.C.G.†

Philadelphia, Pa.

INTRODUCTION

In the patient with obstructive jaundice the most critical point to be determined is that bile does or does not flow into the intestinal tract. The absence of bile from the intestine—whether transient or permanent, whether intermittent or prolonged—nearly always indicates the need for surgical relief. Obstructive jaundice does not respect age or sex. The infant's congenital atresia, the "fair, fat and forty" choledocholithiasis and the older patient's neoplasm roughly differentiate the most common causes for obstructive jaundice. These same age

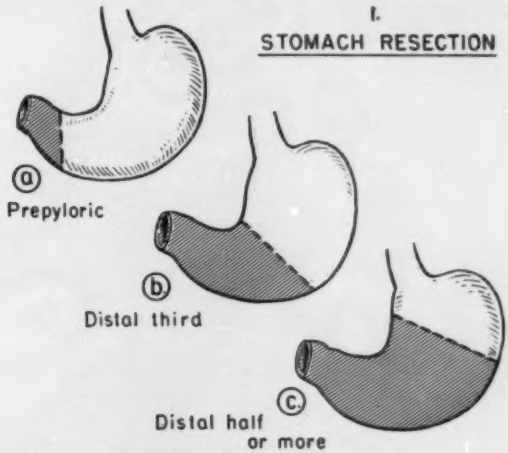


Fig. 1—Gastric resection may be: (a) prepyloric; (b) distal third, or (c) distal half or more.

groups, however, may also include virus hepatitis, hemolytic anemia, *hyperemesis gravidarum,* pancreatic infection, cholangiolitis and parasitic disease.

It is also true that severe disease of the bile ducts can exist without jaundice[2]. For example, a seven-year old patient without jaundice recently had a huge choledochus cyst, wherein the channel for bile flow for more than 6 cm. was less than 3 mm. in diameter. In addition, it is well known that calculi may exist within the bile duct for long intervals prior to hepatic decompensation and the appearance of jaundice.

---

*Presented before the Course in Postgraduate Gastroenterology of the American College of Gastroenterology, New York, N. Y., 18, 19, 20 October 1956.

†Assistant Professor of Surgery, Graduate School of Medicine, University of Pennsylvania and Staff Surgeon, the Albert Einstein Medical Center, Philadelphia.

Diagnosis

To establish diagnosis—adequate history and careful examinations are mandatory. Clinical acumen, medical, physiological and gastroenterologic evaluation are important. It is essential that the progress of the patient under observation is followed by repeated physical examinations.

Recognition of biliary tract obstruction does not need a differential clinical diagnosis among cholangitis, pancreatic edema, or bile duct malignancy. It requires only that the mechanism for the obstruction be identified as pre- or posthepatic.

Very significant are both the duration of jaundice and the preexisting state of liver function. In the various phases of jaundice, laboratory examinations are

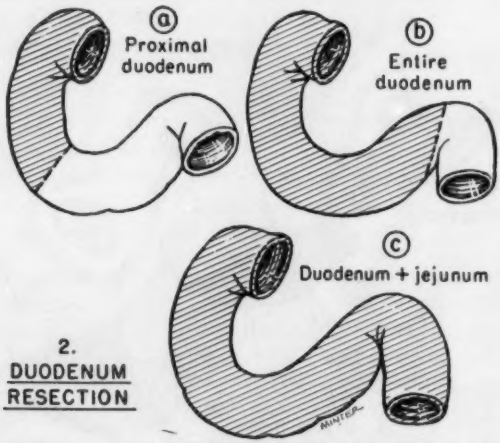


Fig. 2—Duodenal resection may be: (a) proximal; (b) total, or (c) total together with proximal jejunum.

valuable. Selected profile studies to evaluate the presence of flocculation, the filtration and excretory functions and metabolic capacity of the liver are of great importance[33]. For practical purposes the presence or absence of bile and urobilin (urobilinogen) in the stools and in the urine are efficient guides.

It is also desirable not to overlook two additional modes of investigation: x-ray and liver biopsy[3,30].

Oral and intravenous radiologic methods (Cholografin) can indicate the liver function (through excretion of the radiopaque medium), as well as identify anatomy[28]. Bile duct dilatation or a normally functioning gallbladder, when demonstrated radiographically are positive clues as to the character of jaundice in each case. In addition, up to 15 per cent of patients with hepatitis or cholangiolitis

may excrete the radiopaque medium through the biliary tract[10]. But the patient has no way of knowing the percentage group to which he belongs.

I am grateful for radiographic demonstration of biliary tract anatomy preoperatively. Usually[14] when bromsulfalein retention is greater than 20 per cent (after 45 minutes) the biliary tract cannot be visualized radiographically (Cholografin).

A supplement to laboratory and chemical evaluation in many patients is liver biopsy[4,18]. Complications ordinarily are so minimal that the information obtained far exceeds any deleterious effect. Failure to provide a positive diagnosis is not an inherent error in aspiration biopsy of the liver. If the diagnosis of cirrhosis, cholangiolitis, primary or metastatic malignancy or hepatic necrosis can be made we would avoid unnecessary operations.

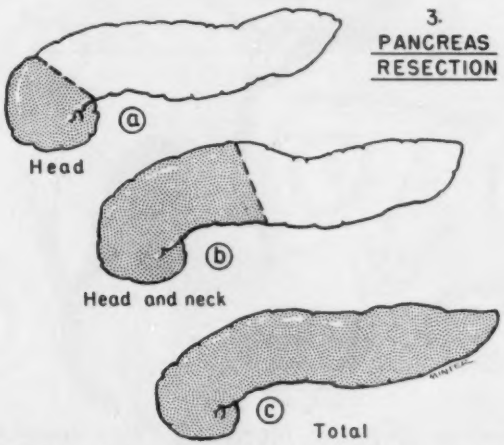


Fig. 3—Pancreas resection may be: (a) head; (b) head and neck, or (c) total.

It has been thought that surgical intervention should be postponed if serum bilirubin decreases[5,24]. Decrease in serum bilirubin level, however, or its failure to reach extreme heights does not always indicate that obstruction has been overcome[12]. When serum bilirubin level is decreasing, the clinician should obtain evidence that bile is reaching the intestinal tract before concluding that duct obstruction has been relieved. If bile is not observed in the stool it may be that a decreased (or stabilized) level of serum bilirubin is evidence of hepatic failure. It is under such circumstances that white bile is found in the bile ducts. This one fact alone indicates the individualization required in each case of obstructing jaundice.

The late Roy Upham, studied the differential diagnosis and treatment in biliary tract disease most carefully. He indicated[29] the contrast between the

concept of "simple surgical removal of gallstones" and the actual intricate pattern of biopsies and treatment required in each patient. He stated, that "the advances in medical therapy have not kept pace with newer diagnostic means . . . nor with . . . surgical therapy".

It behooves us to use all possible means to establish a diagnosis. If, however, we cannot identify the cause in any individual patient, it is sufficient to recognize that obstruction to bile flow is present and that its relief by surgery is required.

Preoperative Management

Selection of the best time for choledochotomy in a patient with obstructive jaundice does not depend upon the level of jaundice. It depends upon the

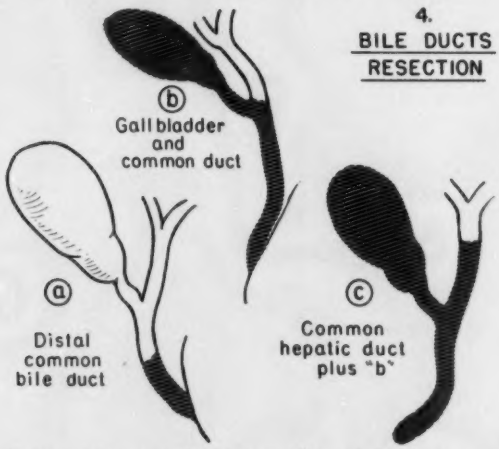


Fig. 4—The bile ducts resection may be: (a) papilla and distal common bile duct; (b) the gallbladder and entire common bile duct, or (c) these plus the distal common hepatic duct.

patient. From a surgical standpoint the patient needs an adequate blood count, a normal prothrombin time and a cooperative state of mind. But the major considerations for successful operation reach beyond these.

We recently surveyed close to ten years of work at the Albert Einstein Medical Center[26]. We found that in the 4,300 deaths over this period, 106 were due to the biliary tract.

Of these 106 deaths, 63 had not had an operation. Twenty-eight of the 63 had advanced malignant disease. The other 35 had biliary tract disease which might have been relieved surgically.

Of the 43 who did not survive surgical procedures, 3 died directly as a result of the surgery of the biliary tract. The other 40 died from extrabiliary

tract causes such as myocardial infarction, arteriosclerotic cardiovascular disease, bronchopneumonia, pulmonary embolism, duodenal ulcer, renal insufficiency, hypertension, cirrhosis of the liver and pulmonary tuberculosis.

Optimal management cannot be on the basis of observations made by four blind men who feel separate portions of the elephant's body. The overall picture is truly important. The patient with obstructive jaundice has the same possibilities for breakdown and degeneration that other patients have.

Surgical therapy for obstructive jaundice should take adequate cognizance of these individual problems. In some instances, digitalization or other specific

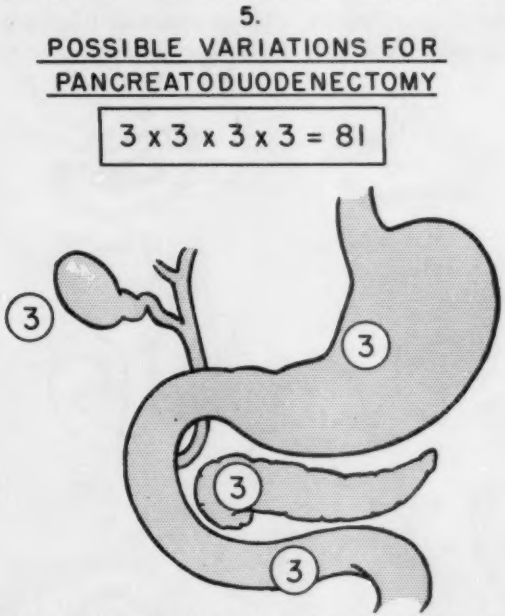


Fig. 5—Three possible resections for each of four organs means that there are 81 possible variations in the operation of pancreatoduodenectomy.

therapy prolongs the patient's preparation for surgery. In other cases, vitamins (K, B) intravenous albumin, blood and parenteral alimentation are needed to reinforce hepatic function. In other patients, peptic ulcer, diverticulosis, bronchosinusitis, or an anxiety-neurosis require concise and individualized management. For over all benefit, however, surgery for obstructive jaundice should not be delayed too long.

Anesthesia

The multiplicity of drugs, methods and capabilities of each anesthesiologist today provide an opportunity for careful selection of anesthesia.

Each individual patient should be evaluated, in consultation, after the anesthesiologist examines the patient. A few minutes prior to induction within ear-shot of a narcotized patient, is not the time for heated discussion on the merits of subarachnoid block versus endotracheal ethylene. It is wise to establish adequate "rapport" amongst patients; this procedure adds to universal confidence.

The use of cortisone and other agents are indicated selectively[17]. Again the anesthetist who sees the patient for a brief interval should wisely consult with the physician who has suffered and understands the patient's idiosyncrasies.

At operation—adequate airway, efficient muscular relaxation and assistance during cholangiography are among the basic objectives to be met by the anes-

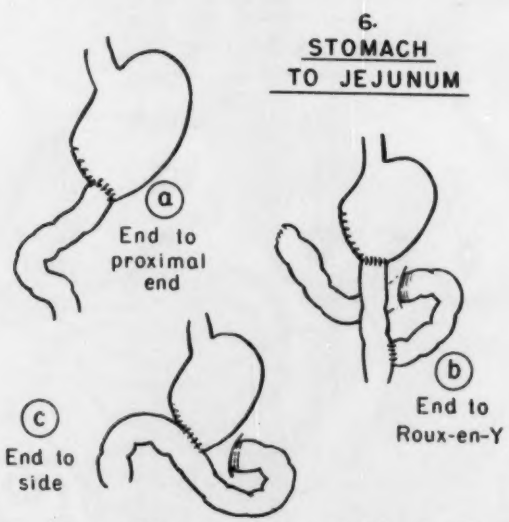


Fig. 6—Gastrojejunostomy may be done: (a) end-to-end; (b) end-to-Roux-en-Y, or (c) end-to-side.

thetist. Selection of agents including intravascular fluid and drugs are in his domain. The use of blood should be reserved for acute blood loss and following rapid decompression of bile passages[24].

Normally, from 17 to 40 per cent of the blood volume is circulating through the liver. This is altered by dilated bile ducts in patients with obstructive jaundice. After surgical decompression of an obstructed bile duct a marked blood volume deficit may occur as the liver again retains circulating blood. This can produce severe shock. In certain patients the appearance of shock may be delayed for 6 to 10 hours postoperatively.

Operative Procedure

Surgical objective in relief of obstructive jaundice and restoration of hepatic cell function is accomplished by reestablishment of bile flow.

The common bile duct is a viaduct: it serves to transport bile from the liver to the duodenum. This pipe-line includes a "surgechamber", represented by the gallbladder, which permits both storage and availability. Biliary tract function is primarily that of transportation; its function conforms to physical principles of "hydraulics". Accordingly, obstruction at the papilla to bile flow causes increased intraductal pressures[18,20] at and above 300 mm. full pressure. This produces significant decrease in hepatic cell efficiency. In addition to these direct effects, alterations in renal and cardiovascular function follow changes in hepatic blood supply and hepatic function.

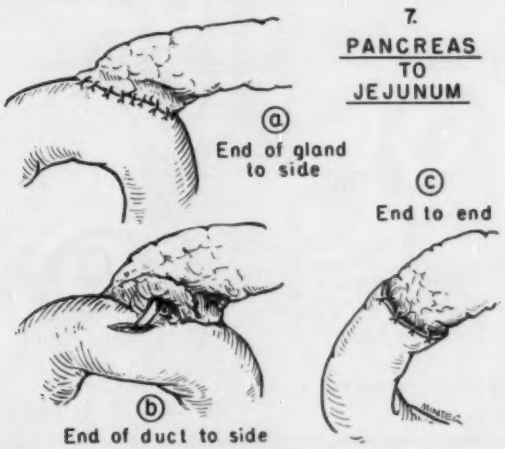


Fig. 7–Anastomosis from pancreas to jejunum may be by: (a) implantation of gland into side of bowel; (b) implantation of pancreatic duct into bowel, or (c) end-to-end anastomosis.

At operation, the surgeon should be prepared to evaluate abnormalities and to correct disease by all means at hand. Gross findings are supplemented by other observations. Manometric and radiologic methods are available at surgery for use in every patient with jaundice.

Jaundice associated with pancreatic disorders may be due to ductal obstruction by the enlarged swollen pancreas. It may also be produced intrahepatically by pericholangitis; this picture is similar to that of cholangitis and is due to pericholedochitis (or choledochitis) wherein inflammation ascends from the pancreas through the hepatic pedicle.

There are many technical procedures available in the management of malignant disease at the papilla.

When tumor is duodenal, pancreatoduodenal resection is done with particular attention to wide excision of the gastric and duodenal mesenteries.

To excise a tumor of bile duct origin (extrapapillary), greater resection of the bile duct and less of the pancreas and intestinal tract is required.

In treatment of tumor of pancreatic origin, the gastrointestinal and biliary tracts are simply excised—around the lesion, but the pancreas should be excised practically *in toto*.

It is seen then that surgical procedure for resection of malignant tumor involving the bile duct is extremely variable. For example, gastric resection may be 1. prepyloric, 2. distal third, or 3. distal half; the duodenum may be resected as 1. first and second portions, 2. entirely, or 3. duodenum plus a segment of proximal jejunum; the pancreas may be resected 1. at the head, 2. the entire

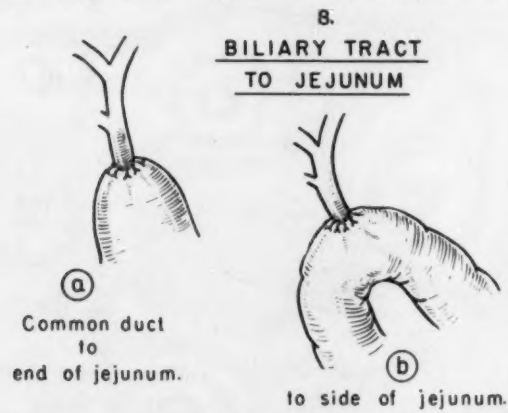


Fig. 8—Biliary tract may be anastomosed to jejunum by: (a) end-to-end, or (b) end-to-side anastomoses.

right half, or 3. totally. The biliary tract may be resected 1. at the common bile duct only or 2. this together with the gallbladder or 3. the resection may extend to include the common hepatic duct. Accordingly, in various combinations there are three to the fourth power or 81 different resections (Figs. 1 to 5).

Similarly the surgeon may restore gastropancreatobiliary and intestinal continuity in 36 different ways (3 stomach to jejunum, 3 pancreas to jejunum, 2 bile duct to jejunum) with or without complementary enteroenterostomy (Figs. 6 to 9).

Nonmalignant disease in the papilla which may produce obstructive jaundice includes inflammatory and traumatic stricture. Jaundice is infrequently associated with interductal reflux, or the dyskinesias. There are often coincident although not etiologic factors in obstructive jaundice.

In the bile duct-inflammation, adhesions, ductal dilatation, ductal deformity and disease may be observed grossly. Many methods are applied to establish positive diagnosis; the best of these is biopsy. Normal tissue, however, seen grossly and microscopically does not rule out tumor. Frozen section diagnosis is possible. An effort should be made to establish origin for malignant tissue at the papilla. This is admittedly difficult.

It is advisable to differentiate choledochitis (inflammation of the periductal tissues) from cholangitis (infection of the duct, primarily the mucosa). Choledochitis requires treatment or drainage of the extrabiliary tract cause, with provision made against dissemination of infection into the biliary tract. In treatment of cholangitis, adequate free drainage is required of the duct and all biliary radicles.

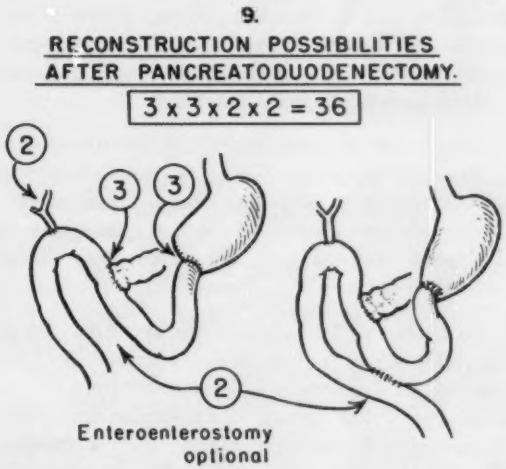


Fig. 9—Since enteroenterostomy may or may not be done to supplement the selected anastomoses after pancreatoduodenectomy, a total of 36 possible reconstruction procedures are found to be possible.

The duct larger than one centimeter in diameter is probably abnormal. Surgical treatment to the obstructed biliary tract should restore normal function to the papilla or provide its equivalent in the transport of bile to the intestinal tract (slides).

The termination for the bile duct is thin, twisting and filiform. This area is transduodenal and is surrounded by a sphincter. The name of "ampulla" is erroneously given to this area. This region presents an expanded bulb distal to the site for apparent union of the bile and pancreatic ducts. On longitudinal section it is found that the enlargement at the end of the duct is a mass of sphincter, rather than a space for a duct or ducts. In order to think correctly,

it is proper to call this area the papilla, not the ampulla. This is seen in patients with traumatic stricture or with dyskinesia as opposed to "spasm". But the duct which is thick and rigid because of preexisting inflammation may not expand in the presence of distal obstruction. Here (slide) is a patient with inflammatory stricture of the common bile duct. The common hepatic duct which is not involved by the infection, is dilated.

Operation in patients with stricture should be as an elective procedure[20,21]. The patient's general condition; systemic and organic, should be at optimal efficiency. Morbidity and mortality in these patients is most frequently due to extrabiliary tract causes. If the patient's condition is precarious, the repair of stricture can be staged, by first establishing adequate drainage of the biliary tract.

From a technical as well as from the patient's points of view, management of stricture must be individualized. Factors to be considered are: cause and location of stricture, presence of additional or residual disease in pancreatobiliary system and the patient's general condition[11,24].

Anatomical factors such as consideration of the transpancreatic course for the common bile duct are important. We know that in ⅓ of cases the bile duct will be extrapancreatic, partially intrapancreatic or totally intrapancreatic. Other specific features to be evaluated are function at the duct termination such as in a patient with dyskinesia and spasm of the sphincter, or diverticula, or calculi and interductal reflux (slides).

In order to afford relief of the patient's disease, it may be elected to bypass the papilla and to establish a duct to bowel anastomosis. Under other conditions a flap of stomach or duodenum is fashioned to create a tube for anastomosis to a short stump of the hepatic duct. Under still other conditions, an intestinal limb is brought up the liver hilum. And as mentioned before, the creation of an adequate internal route for bile flow, is second to importance of establishing normal bile flow without damage from back pressure or infection to the hepatic cell.

A frequent cause for jaundice is residual calculi. These may be prevented, if possible by 1. operative cholangiography to identify them, 2. complete removal of stones by manipulation, fragmentation, lavage, or by newer methods such as that which creates a fibrin clot in the duct to enmesh all small calculi[26]; further 3. an adequate route should be provided through the papilla for the discharge of debris and small calculi; This can be done by transcholedochal sphincter dilatation with the Bakeŝ instruments, or by transduodenal sphincterotomy. The fourth method for prevention of residual calculi is by the use of a T-drain, with a wide lateral limb (size 22 Fr.) which also has additional lumens (in the proximal and distal limbs) for through-and-through as well as for to-and-fro irrigations, as desired[26].

Extrahepatic and extrabiliary tract obstruction may be due to pancreatic infection, or cyst formation, to enlarged lymph nodes, or to calcification, fibrosis, necrosis or inflammatory exudate in the lesser omentum and hepatic pedicle[8,13,23]. In such instances, the common hepatic or common bile duct may be less than 2 mm. in diameter. In another instance, huge necrotic lymph nodes in a case of nocardiosis obliterated the bile ducts. Relief and recovery for the past four years followed intrahepatic duct drainage. Portal hypertension was observed to cause fatal hematemesis in another patient who had five bile duct reconstruction operations. Scar tissue at the hepatic pedicle had become an impenetrable barrier to bile as well as to portal blood.

Dilated bile ducts within the liver may be drained. In patients with "cholestasis" or similar processes wherein the ducts are blocked by exudate, hepatic lobe drainage by decompression may provide the initial impetus to recovery of hepatic function.

Under certain conditions, in the adult—when there no longer are available extrahepatic bile ducts, the liver ducts may be exposed for drainage or for anastomosis with the intestines[16].

In the infant, however, who may be born with a cord instead of a tube, due to an atresia of the bile ducts, the salvage rate is less than 25 per cent. This applies, in fact, to those infants who have some sort of available duct outside the liver.

When no extrahepatic ducts are present, we have hitherto been helpless[15,19,22]. This was the situation in a three-month old, seven pound girl, who was anemic, wizened, sallow, cachectic and extremely yellow. At operation, when she was eight weeks old (at another hospital), it was demonstrated that she had no ducts.

It was possible, however, in this infant, to place five silver tubes (connected to polyethylene tubes for external drainage) within the central liver (hilum) and to inaugurate bile drainage (slides).

It is now over six months since the first few drops of bile appeared through the tubes. The drainage has increased, so that now—up to 30 c.c. a day appears. And with this, the youngster has gained over 15 pounds, her skin is clear (only her eyes are slightly yellow), she has teeth, is eating her family out of house and home, is sitting and turning and is very playful. Sometime after her brother or sister is born and when she is just a bit bigger, an attempt will be made to convert the external fistula by anastomosis to the bowel.

The perforated silver tubes (Southey tubes) inserted within this infant's liver are permitting the return to function of the liver segments which are being drained. Other segments of the liver will begin to atrophy.

In the presence of obstructive jaundice—the outcome cannot be other than fatal. When, however, an external bile fistula is established, long life is possible.

Complete external biliary fistula is compatible with life. Complete bile duct obstruction is not.

Principles of Therapy

At operation for obstructive jaundice, there are three major decisions which may be made[29]. These are individualized on the basis of clinical history and operative findings. The decisions which are available are:

1. Disease is eliminated and reconstruction is accomplished.
2. Disease cannot be removed; a by-pass is established to permit bile flow into the intestinal tract.
3. No further surgery being feasible, the area proximal to the obstruction is intubated for bile drainage and the operation is terminated.

The first decision may be made to eliminate the disease. For example, stones are removed from the bile duct. Transduodenal or transcholedochal sphincterotomy may be done. Excision of the papilla with duct reimplantation may be required. A stricture may be excised and the duct repaired provided complementary sphincter dilatation or sphincterotomy is also done.

The second decision; to by-pass an irremediable state may be accomplished by duct-intestinal anastomoses of many types. Palliative procedures are legion and devious. Ingenious procedures are justified to provide gastrointestinal and general comfort.

Side-to-side duct-duodenostomy may be done; a limb or loop of jejunum may be used for anastomosis with a dilated duct or anastomosis may be accomplished between an intrahepatic bile radicle to the intestinal tract.

The third decision; to provide drainage, is indicated in the patient whose general condition is poor. Rapid deterioration of the patient's state may occur during the operative procedure, and it is desirable to discontinue surgery.

In other instances, particularly those of long-standing obstruction or in acute obstruction with severe infection, no bile is found in the ducts. Clear, gray mucoid fluid, (white bile) in the ducts indicates hepatic failure to produce bile. In this state simple drainage procedure is done because of the patient's intolerance to much anesthesia and manipulation.

Occasionally an additional maneuver may be justified. This is, to establish a jejunostomy for refeeding bile drained through the fistula. Whether bile is permitted to reach the duodenum under these circumstances is not as important

as the relief of obstruction[32]. Secondary operation to reconstruct a route for bile flow into the intestines, may be done, after hepatic function has been restored.

Postoperative Problems

Postoperative complications are also managed individually. Among such sequellae are increasing persistent jaundice, hemorrhagic diatheses, hypoproteinemia, electrolyte imbalance, infections, renal insufficiency and pulmonary or cardiovascular deterioration. In addition there are such late postoperative sequellae as the so-called "postcholecystectomy syndrome".

Even though clinical improvement occurs in some patients, following release of bile duct obstruction an increase in level of serum bilirubin may be noted. In such cases, the character and quantity of bile drainage together with the presence of bile in the fecal current are a source of delight to the surgeon regardless of the level of serum bilirubin. Perhaps future investigation will indicate whether this jaundice following decompression is produced by shifts in hepatic and blood volume, or due to reabsorption of excess pigment from periportal spaces, or resurgent "back-lash" effect with over-production of bile pigment.

Summary

The surgeon's approach to obstructive jaundice is influenced by the need to assure normal bile flow as a method for restoring normal hepatic function. Surgical therapy for obstructive jaundice should recognize general medical and surgical features present in each individual patient. These extrabiliary factors should be corrected to within limits of normal for the patient. Surgical intervention in obstructive jaundice should not be delayed too long.

Treatment of the disease may not be determined until operation. The surgeon can remove and reconstruct, or merely palliate and drain. Whether bile is permitted to reach the duodenum is not as important as the relief of obstruction. Secondary operation to reconstruct a proper route for bile flow into the intestine may be done subsequently, after hepatic function has been restored.

In each situation we need complete information concerning the findings in each individual. Although the course of obstructive jaundice follows a pattern, attention to specific problems is required in each individual patient.

REFERENCES

1. Berk, J. E.: Diagnostic features of pancreatic disease. J.A.M.A. **159**:1079-1083, (12 Nov.), 1956.
2. Brem, T.: Recognition of biliary tract obstruction without jaundice. J.A.M.A. **159**:1624-26, (24 Dec.), 1955.
3. Cayer, D. and Henry, O., Jr.: The diagnosis of jaundice: An evaluation of the procedures commonly utilized in differential diagnosis. Geriatrics **11**:191-199, (May), 1956.

4. Christian, R.: The value of biopsy of the liver. Am. J. Gastroenterology. **25**:253-265, (March), 1956.
5. Colcock, B. P. and McManus, J. E.: Experience with 1,356 cases of cholelithiasis. Surg. Gynec. & Obst. **101**:161-172, (Aug.), 1955.
6. Dubin, I. N. and Johnson, R.: Jaundice with hyperbilirubinemia. Medicine, **33**:155-157, 1954.
7. Eanet, M. P. and Brick, I. B.: Constitutional hyperbilirubinemia: its differential diagnosis and the effect of steroid therapy. New England J. Med. **253**:1062-1065, (15 Dec.), 1955.
8. Edline, Y.: Studies on carbohydrate metabolism. Acta. chir. Scandinav. **96**:136-160, 1948.
9. Foley, E., Kilpatrick, J. T. and Crabtree, S. F.: Chronic recurrent pancreatitis due to injury to the duct of Santorini; A complication of subtotal gastrectomy. Ann. Surg. **144**:87-92, (July), 1956.
10. Gifford, J. H. and Kahlstrom, S. C.: Operative cholangiography. West. J. Surg. **63**:605-606, (Sept.), 1955.
11. Glenn, E., et al: Intravenous cholangiography. Ann. Surg. **140**:600-614, (Oct.), 1954.
12. Hallenbeck, A., Walters, W., Gray, K. et al: Report on surgery of the biliary system and pancreas for 1954. Proc. of staff meeting of Mayo Clinic. **30**:640-646, 1955.
13. Hawthorne, H. R. and Sterling, J. A.: Acholia. Am. J. Gastroenterology. **21**:355-365, 1954.
14. Jordan, G. L. and Shelton, E. L.: Significance of jaundice following pancreatoduodenal resection. J.A.M.A. **162**:196-197, (15 Sept.), 1956.
15. Jordan, G. L.: The use of intravenous cholangio-cholecystography in the diagnosis of acute conditions of the abdomen. Surg. Gynec. & Obst. **102**:218-226, (Feb.), 1956.
16. Koop, C. E. and Kiesewetter, W. B.: Extrahepatic atresia of the bile ducts. Ann. Surg. **139**:506-509, 1954.
17. Longmire, W. O., Jr. and Sayford, M. D.: Intrahepatic cholangiojejunostomy for biliary obstruction—further studies. Ann. Surg. **130**:455-465 (Sept.), 1949.
18. MacGregor, A., Griffith, B. and Munro, A.: The influence of stress upon liver function in obstructive jaundice. A.M.A. Arch. Surg. **71**:395-403 (Sept), 1955.
19. Madden, L., McCann, J. and Lorf, M.: Surgery of the gallbladder and bile ducts. Scientific Exhibits, A.M.A., 1956.
20. Moore, T.: Common duct exploration and drainage for obstructive neonatal jaundice. Ann. Surg. **138**:111-114 (July), 1953.
21. Moncrief, A.: Extrahepatic biliary duct obstruction due to stricture. A.M.A. Arch. Surg. **70**:519-529, (April), 1955.
22. Pearse, H. E.: End result of using vitalium tubes in common duct strictures. Am. J. Surg. **89**:1191, (June), 1956.
23. Redo, F. S.: Congenital atresia of extrahepatic bile ducts. A.M.A. Arch. Surg. **69**:886-887, (Dec.), 1954.
24. Snape, W. J.: Duodenal ulcer as an occasional etiologic factor in obstructive jaundice. Ann. Int. Med. **42**:1001-1010, (May), 1955.
25. Sterling, J. A.: The Biliary Tract. Williams & Wilkins Co., Baltimore, Md., 1955.
26. Sterling, J. A.: Use of fibrin clot for choledocholithotomy. J. Albert Einstein Med. Center. **3**:104-107, 1955.
27. Sterling, J. A. and Virabute, S.: unpublished data.
28. Sterling, J. A.: T-drain for use in the common bile duct. Surg. Gynec. & Obst. **100**:162, 1955.
29. Wise, E. and Warren, K. W.: Intravenous cholangiography in clinical surgery. Scientific Exhibits, 1956. A.M.A.
30. Upham, R.: Pre- and postoperative problems of the gall tract. Am. J. Gastroenterol. **21**:366-385, (May), 1954.
31. Vorhaus, L. J.: Some perplexities in the problems of jaundice. Am. J. Gastroenterol. **25**:171-174, (July), 1956.
32. Weir, R. A. and Lizane, C.: Operative cholangiography. Mississippi Med. **53**:280-284, (April), 1956.

33. Zieve, Leslie and Hill, Earl: An evaluation of factors influencing the discriminative effectiveness of a group of liver function tests; The utilization of multiple measurements in medicine; Normal limits of 11 representative hepatic tests; Relative effectiveness of hepatic tests in cirrhosis. Gastroenterology. **28**:759-785, 1955.

Discussion

Dr. I. Snapper:—I was happy to hear the enthusiasm of Dr. Sterling for the surgical help which can be brought to patients with a postcholecystectomy syndrome not caused by stones in the biliary ducts. Personally I have never seen any relief of pain after operations for the so-called dysfunction or dyskinesia of the sphincter of Oddi, although I've seen many such patients operated by many different surgeons.

I always look askance at the remarkable results which occasionally have been obtained in such cases. I know one patient who was operated for this syndrome three times by famous surgeons. The last operation was a sympathectomy—all to no avail. When thorazine became available, this patient took one tablet and got immediate relief. She hasn't taken any thorazine except for this one miraculous tablet, and she is still in excellent shape. She has regained all the weight she had lost and has been resuscitated from an incurable invalid to an attractive and apparently healthy woman.

THE LABORATORY DIAGNOSIS OF PANCREATIC DISEASE: SECRETIN TEST*

DAVID A. DREILING, M.D.

and

HENRY D. JANOWITZ, M.D.

New York, N. Y.

Introduction

The detection of functional abnormality of the pancreas has always been limited by the large reserve of the organ as well as its ability to recover normal activity very rapidly in the clinical course of inflammation. Numerous investigators[1-4] have shown that the most accurate method of estimating pancreatic function and of diagnosing pancreatic disease is by direct study of the duodenal drainage following stimulation of the organ with intravenous secretin. An analysis of the results of 1,500 secretin studies will be presented to illustrate the clinical usefulness of this laboratory procedure.

Methods

The secretin test is performed upon patients in the fasting state. Under fluoroscopic control, a double-lumened gastroduodenal tube is positioned at the ligament of Treitz and both outlets are placed under constant gentle suction. Under these conditions, it is possible to obtain quantitatively uncontaminated gastric and duodenal juices. Following a control collection period of 20 minutes, 1.0 clinical unit of secretin per kilogram is injected intravenously, and then, drainage is obtained in divided 20 minute specimens for a fixed interval, preferably 80 minutes[5,6], by which time the submaximal stimulus used is dissipated.

The following determinations are made on the duodenal specimens: volume, bicarbonate concentration, amylase concentration, biliary pigment concentration (icterus index), guaiac reaction, and cellular morphology. The latter factors, guaiac reaction and cellular morphology, have become of increasing importance in the diagnosis of patients with suspected pancreatic neoplasm. Utilizing careful collection technics, a number of observers have reported a high percentage of smears positive for cancer cells in patients with pancreatic tumor[6,7]. Cell smears are most profitably made on the initial control specimens and from duodenal washings following the secretin test proper.

---

*Presented before the Course in Postgraduate Gastroenterology of the American College of Gastroenterology, New York, N. Y., 18, 19, 20 October 1956.

From the Department of Surgery and the Gastrointestinal Clinic, The Mount Sinai Hospital, New York, N. Y.

The secretin used in this study was donated by the Eli Lilly Co.

Study of the *icterus index* of the duodenal specimens following secretin constitutes an extension of the Lyon-Meltzer technic of biliary drainage. From the behavior of the biliary pigment concentration, i.e. the disappearance of bile, the persistence of bile, or the complete absence of bile during the test, it is possible to determine not only the patency and functioning of the external biliary tract[8] but also one is enabled to diagnose incomplete biliary obstruction[9] and to localize the precise site of pathology in patients with obstructive jaundice[10].

The *total volume flow*, the *bicarbonate secretion*, and the *rate of enzyme elaboration* characterize the pancreatic response to secretin. In the normal patient, following the injection of secretin, there is a rapid increase in the rate of pancreatic flow from 1 ml./min. to 4 ml./min. This increase subsides slowly and disappears at the end of 80 minutes. Depending upon body weight, 100-300 ml. are obtained in this time. Volume flow is reduced by pancreatic duct obstruction or by destruction of pancreatic parenchyma.

TABLE I

EIGHT MINUTE RANGES DETERMINED STATISTICALLY FROM THE SECRETIN RESPONSES OF 123 NORMAL SUBJECTS STUDIED WITH LILLY SECRETIN

	Total Volume ml./kg.	Max. HCO_3 Conc. mEq./l.	Total Amylase u./kg.
Observed range	2.0-6.2	88-137	6.0-27.2
Mean value	3.22	107	14.9
Calculated range	2.1-4.3	91-125	8.3-21.5
Lower limit used	2.0	90	6.0

The bicarbonate concentration of the duodenal specimens following secretin rises and falls as does the volume flow. The maximum concentration appears in the 20-minute or 40-minute collection. In the normal patient, this concentration may rise as high as 130 mEq./l., but in subjects with pancreatic inflammatory disease, the ability to elaborate a high bicarbonate concentration after secretin is much impaired.

Secretin does not affect the rate of enzyme secretion. As the volume flow increases, the enzyme concentration decreases. Enzyme concentration values, *per se*, are of little value in the diagnosis of pancreatic disease, but rates of enzyme secretion, or, in effect, *total enzyme secretion* is significant[5]. A decrease in enzyme secretion may occur in pancreatic duct obstructions due to loss of volume secretion and also in pancreatic fibrosis due to destruction of secreting parenchyma[11]. In routine studies, in accordance with the principle of parallelism of enzyme secretion[12], only the enzyme, amylase, need be determined. Lipase and

trypsin values are only occasionally informative in children with cystic fibrosis of the pancreas or in idiopathic steatorrheas[13].

Normal Ranges

The normal ranges for volume, bicarbonate, and amylase in the secretin test can be obtained by a statistical analysis of the responses in normal subjects. The values will vary according to the specific secretin preparation employed, the length of the collection period, and the details of technic. The most reliable data can be obtained with 80-minute collections but statistically valid ranges can be determined for shorter intervals[14]. It is highly desirable for each clinic to establish its own ranges by a preliminary series of studies on normal subjects.

TABLE II

Average Secretin Test Response Data of 114 Patients with Cancers of the Pancreas

	No. of Cases	Total Volume Secretion ml./kg.	Max. HCO_3 Conc. mEq./l.	Total Amylase Secretion u./kg.
Diffuse	20	1.2	54	4.2
(% in Normal Range)		(0%)	(0%)	(0%)
Head	58	1.5	84	5.3
(% in Normal Range)		(2%)	(76%)	(77%)
Body	24	1.7	89	6.1
(% in Normal Range)		(4%)	(92%)	(92%)
Tail	12	3.6	109	15.4
(% in Normal Range)		(100%)	(100%)	(100%)
Average normal series	123	3.2	108	14.9
Lower limit normal series		2.0	90	6.0

The *normal ranges* determined from the 80-minute data of 123 normal patients studied with Lilly secretin are given in Table I[14]. Since there is no clinical evidence for the existence of hypersecretion syndromes, in actual practice, the low limits of the normal ranges—for volume, 2.0 ml./kg., for bicarbonate concentration, 90 mEq./l., and for amylase secretion, 6.0 u./kg.—are the critical values. The expression of volume and amylase values on a per kilogram basis is a maneuver which has been found to reduce statistical scatter in the data of normal subjects[5].

Results

Study of the secretin responses in our large clinical series has disclosed that fundamentally two types of responses can be described:

1. One in which there tends to be a reduction of volume with a maintenance of bicarbonate and enzyme secretion, and

2. One in which the volume secretion is sustained by the bicarbonate response and to a lesser extent the enzyme secretion is diminished.

The *quantitative deficiency* is characteristic of pancreatic duct obstruction as seen in tumor; the *qualitative deficiency* is indicative of inflammatory disease of the pancreas.

1. Pancreatic Tumor:—The alteration of the secretin response in pancreatic tumor depends upon the site and degree of pancreatic duct obstruction[10]. The secretin test data of 114 patients with pancreatic cancer are presented in Table II. In the majority of the cases, there is merely volume reduction, but, in the

TABLE III

AVERAGE SECRETIN TEST RESPONSE DATA IN 78 PATIENTS WITH ACUTE PANCREATITIS AND IN 135 PATIENTS WITH CHRONIC PANCREATITIS

	No. of Cases	Total Volume Secretion ml./kg.	Max. HCO_3 Conc. mEq./l.	Total Amylase Secretion u./kg.
Acute pancreatitis	78	2.5	92	10.2
(% in Normal Range)		(77%)	(70%)	(70%)
Chronic pancreatitis	135	2.3	53	6.8
(% in Normal Range)		(62%)	(2%)	(46%)
Average normal series	123	3.2	108	14.9
Lower limit normal series		2.0	90	6.0

extensive lesions which destroy large portions of the secreting parenchyma, there may be a reduction of bicarbonate and amylase as well. The greatest abnormalities of this group are to be expected and occur in lesions of the head of the pancreas because these tumors obstruct a major pancreatic duct. In tumors of the body of the pancreas, the secretion defect is usually in volume alone. The secretin test is most valuable in the recognition of body lesions, which, during their early stages can hardly be diagnosed by any other means. Pancreatic body cancer should be suspected in patients presenting a symptom complex of weight loss, midback pain, recent diabetes, and diarrhea with or without steatorrhea. Tumors of the tail of the pancreas do not produce an alteration of pancreatic secretion since they can neither obstruct a major duct nor can they destroy significant parenchyma. Diabetes, *per se,* does not affect the external pancreatic secretion, nor do tumors contiguous to the pancreas.

2. *Pancreatitis:*—The secretin test has little practical value in the diagnosis of acute pancreatitis[15]. The functional capacity of the gland rapidly returns to normal during the first week of illness. In those patients who are desperately ill, the test can hardly be done; in those who are comparatively well, the likelihood of normal secretion is great. One must rely upon the serum amylase and other tests for the diagnosis of acute pancreatitis.

The response to secretin in those patients with acute pancreatitis who are studied may show abnormality in volume, bicarbonate, and/or amylase, attesting to the combined presence of ductal obstruction and parenchymal damage. On the other hand, all three critical factors may be normal, illustrating that a normal secretin test does not exclude the diagnosis of acute pancreatitis. Table III presents the secretin test data of 78 patients with acute pancreatitis. The figures emphasize both the over all tendency towards normal secretion and the high frequency of normal values.

TABLE IV

THE USE OF THE PANCREATIC AND BILIARY PIGMENT RESPONSES IN THE DIFFERENTIAL DIAGNOSIS OF JAUNDICE

Pancreatic Response	Biliary Response	Lesion Site
Abnormal	Abnormal	Head of Pancreas
Normal	Abnormal	Extrahepatic Biliary Tract
Normal	Normal	Intrahepatic-Hepatocellular

Despite the limited usefulness of the secretin test in the diagnosis of acute pancreatitis, the test has some value in this group of patients. It should be performed after the subsidence of all clinical signs and symptoms. If this is done, the persistence of abnormal secretion indicates the continuation of inflammatory pathology and prognosticates chronic pancreatitis.

In chronic pancreatitis, abnormal secretion is regularly encountered. The consistent alteration of the secretin response is a marked lowering of the maximum bicarbonate response. The volume tends to remain normal in all but the very advanced cases. Enzyme secretion is spared to a lesser extent. Whether this dissociation of defect means a differentiation of function between the acinar and intralobular duct cells or a differential loss of function of one secreting cell is not clear. The prominence of bicarbonate defect in the secretin test in patients with chronic pancreatitis does not imply that the ability to produce a potent buffering juice is more consistently and more characteristically lost than the ability to secrete enzymes. It results, rather, from the use of a specific stimulus, secretin, which augments the bicarbonate formation but does not influence enzyme elaboration.

The secretin responses of 135 patients with proved chronic pancreatitis, presented in Table III, demonstrate the marked defect in bicarbonate secretion. The finding that more than half of the patients were capable of secreting normal volumes is surprising in view of the widespread acceptance that pancreatic ductal obstruction is a major etiologic factor in the pathogenesis of this disorder.

Comparison of the data for tumors with that of patients with chronic pancreatitis (Table III), at once suggests the difficulty of interpreting a test in which there is reduction of all three factors. This may occur in about 15 per cent of all abnormal cases. Such a deficiency of secretion does not permit absolute differentiation between the two affections. The difficulty may be resolved, however, by the clinical history as well as the demonstration of malignant cells in the drainage. The problem, fortunately, does not arise in the most important diagnostic area, i.e. in patients whose pathology is of recent origin.

3. *Gastrointestinal Disorders:*—The data of the pancreatic response to secretin together with the corollary information concerning the patency and function of the biliary tract can be useful in the elucidation of pathogenetic factors in various gastrointestinal disorders and in estimating the symptomatic significance which pancreatic deficiency may have in these syndromes.

In patients with *obstructive jaundice,* the pancreatic and biliary pigment responses can be utilized to precisely localize the site of pathology[8]. The possibilities are presented in Table IV:

1. If there is evidence of both pancreatic and biliary tract obstruction, the lesion must lie in the head of the pancreas.

2. If the pancreatic function is normal in the presence of biliary obstruction, the lesion must lie in the extrahepatic biliary tract, whether stone, stricture, or tumor, cannot be predicted from the test findings, and

3. If jaundiced patients have normal pancreatic and normal biliary flow, the suspicion by inference is for hepatocellular pathology.

Hepatitis, per se, does not alter the pancreatic secretion. The biliary flow, however, may be profoundly affected: in the early stages, there is obstruction; at the inception of recovery, hypercholeresis is evident; and in the late recovery phase, the biliary flow returns to normal. The secretin test, thus cannot be used to differentiate hepatitis from obstructive jaundice.

The secretin test has great diagnostic value in the investigation of patients with the *postcholecystectomy syndrome.* Abnormal pancreatic secretion will disclose the small percentage with chronic pancreatitis. Abnormal biliary flow can indicate those with persistent biliary calculi. These findings, together with intravenous cholangiography, now make it possible to determine which amongst this group of patients can be benefited by surgery.

Amongst patients with idiopathic diarrheas, steattorrheas, sprue syndrome, ulcerative colitis, and regional ileitis, unsuspected pancreatic insufficiencies due to fibrosis can be uncovered in a small percentage of patients. These deficiencies derive from a nutritional pancreatic fibrosis and have been correlated with the pathology of postmortem material[15]. Such patients can be benefited by replacement therapy with pancreatin.

Patients with peripheral thrombophlebitis and thromboembolic phenomena may be studied to advantage with the secretin test[16]. Investigation of this group has not only demonstrated the classical association with pancreaticocarcinoma but also revealed an apparent relationship to pancreatic inflammatory disease. The pathogenetic bases of these associations have remained unexplained.

4. Errata:—No scientific presentation is complete without a discussion of the failures as well as the successes. The errors in diagnosis of the secretin test range about 4 per cent. A 2 per cent error is inherent in any biologic method based upon a range statistically determined between +2 sigma and —2 sigma. But beyond this, mistakes will occur due to technic and interpretation. Some of these are avoidable, others are not.

False positives will occur if the tube is displaced during the drainage or becomes plugged. The latter should be avoided by periodically forcing air through the tube outlets. The former can be minimized if all patients with abnormal drainage are fluoroscoped at the termination of the test. If the tube is displaced, it should be repositioned and the procedure repeated.

False negatives occur when tumors have ulcerated and do not cause pancreatic duct obstruction. This has been observed in a patient with cancer of the papilla; even jaundice was absent. Occasionally, a tumor will be so situated, in the uncinate process for example, that a major pancreatic duct is not obstructed. In rare instances, if a large duct is obstructed, the collateral development of the minor pancreatic duct may be so extensive that there is actually little interference with the flow of pancreatic juice into the duodenum. Errors due to such factors are unavoidable but fortunately rare.

Summary

1. The results of 1,500 case studies have shown the secretin test to be a reliable method of investigating the function of the external pancreatic gland and of diagnosing inflammatory and neoplastic disease of the pancreas.

2. Based upon statistical ranges of the volume, bicarbonate, and amylase response to secretin in normal subjects, it is possible to describe two types of defects in pancreatic secretion in patients with pancreatic disease: a *qualitative* one which is characteristic of chronic pancreatic inflammation and a *quantitative* one which is indicative of pancreatic duct obstrution as seen in tumor. In ad-

vanced pancreatic disease, the defect may be both qualitative and quantitative. In such instances, it is impossible from the secretin test findings, *per se*, to differentiate between cancer and chronic pancreatitis.

3. The pancreatic response to secretin together with the biliary pigment response make it possible to localize the site of pathology in obstructive jaundice, to recognize surgical lesions in patients with the postcholecystectomy syndrome, and to disclose deficient pancreatic secretion in various digestive disorders.

4. The secretin test presents inherent, avoidable, and unavoidable errors in diagnosis. False positives and false negatives will occur but the percentage of mistakes can be kept below 4 per cent by careful technic and cautious interpretation of results.

REFERENCES

1. Lagerlof, H.: Pancreatic Function and Pancreatic Disease. Macmillan, N. Y., 1942.
2. Diamond, J. S., et al.: The Use of the Secretin Test as a Clinical Test of Pancreatic Function. Am. J. Digest. Dis. **6**:366, 1939.
3. Friedman, M. H. F. and Snape, W. J.: Pancreatic Secretion in Man in Response to Administration of Secretin and Insulin. Fed. Proc. **6**:107, 1947.
4. Lake, M.: Diagnostic Value of the Secretin Test. Am. J. Med. **7**:18, 1947.
5. Dreiling, D. A. and Hollander, F.: Studies in Pancreatic Function II. A Statistical Study of Pancreatic Secretion in Patients without Pancreatic Disease. Gastroenterology **15**:620, 1950.
6. Lemon, H. M. and Byrnes, W. W.: Cancer of the Biliary Tract and Pancreas. J.A.M.A. **141**:254, 1949.
7. McNeer, G. and Ewing, J. H.: Exfoliated Pancreatic Cancer Cells in Duodenal Drainage. Cancer **2**:643, 1949.
8. Dreiling, D. A. and Lipsay, J. J.: The Use of the Secretin Test in the Diagnosis of Biliary Tract Disease: A Report of 327 Case Studies. Gastroenterology **17**:242, 1951.
9. Dreiling, D. A.: Studies in Pancreatic Function III. The Use of the Secretin Test in the Diagnosis of Patients with the Postcholecystectomy Syndrome. Gastroenterology **16**:162, 1950.
10. Dreiling, D. A.: Studies in Pancreatic Function IV. The Use of the Secretin Test in the Diagnosis of Tumors in and about the Pancreas. Gastroenterology **18**:184, 1951.
11. Dreiling, D. A. and Janowitz, H.: The Pathophysiology of the Pancreas. Advances Int. Med. **7**:65, 1955.
12. Baxter, S. O.: Parallel Concentration of Enzymes in Pancreatic Secretion. Am. J. Digest. Dis. **2**:108, 1935.
13. Diamond, J. S., et al: The Secretin Test as an Aid in the Differential Diagnosis of the Steatorrheas. Rev. Gastroenterology **7**:429, 1940.
14. Dreiling, D. A.: The Technique of the Secretin Test: Normal Ranges. J. Mt. Sinai Hosp. **11**:363, 1955.
15. Dreiling, D. A.: Studies in Pancreatic Function V. The Use of the Secretin Test in the Diagnosis of Pancreatitis and in the Demonstration of Pancreatic Insufficiencies in Gastrointestinal Disorders. Gastroenterology **24**:540, 1953.
16. Dreiling, D. A., Blum, L. and Sanders, M.: Thrombophlebitis, Blood Coagulation and Pancreatic Disease. A.M.A. Arch. Int. Med. **96**:490, 1955.

Discussion

Dr. O. H. Wangensteen:—This impressive paper by Dr. Dreiling and Dr. Janowitz certainly can be of practical value for practitioners of medicine, as it

relates to diagnosis. I presume one stricture which may attend its frequent use in clinical practice is the difficulty of application of the method. It takes the type of dedication which Dr. Dreiling has demonstrated here to bring out some of the valuable facets of the method. I hope that Dr. Dreiling will tell us something about which preparation of secretin he is using—whether the American or the Swedish product. Application of the secretin test should make identification of tumors of the body of the pancreas easier. Cancers of the body of the pancreas are notably exceedingly difficult to recognize by conventional means.

The so-called Ogilvie syndrome, has been cited as useful in recognizing tumors of the body of the pancreas; it is largely, however, a method of diagnosis by exclusion. In patients with symptoms of intestinal colic—patients having colic and intestinal noises demonstrable by the stethoscope, but in whom no evidence of obstruction is found, including a negative study of the colon for obstruction—such patients may have a cancer of the body of the pancreas. This organ has a very thin capsule. The cancer extends and involves the sympathetic ganglia of the celiac and superior mesenteric arteries, causing the disturbance in intestinal motility. Another difficulty which patients with these findings may have is impending obstruction of the superior mesenteric artery—in other words, a thrombosis of that vessel. Ageing patients, complaining of intermittent intestinal colic, in whom no objective findings are demonstrable, become shifted about from clinic to clinic in our hospitals. Sometimes we diagnose them as instances of "spastic ileus". In the third edition of my book, *Intestinal Obstructions* (C. C. Thomas, 1955), I found it necessary to confess that I had operated on a few patients with spastic ileus in whom no cause for the distention was found. Some of these patients may have an impending occlusion of the superior mesenteric artery. An aortogram or a retrograde catheter pushed up through a small arteriotomy in one of the femoral arteries followed by the injection of Renografin might succeed in recognizing the existence of partial occlusion of the superior mesenteric artery when the situation could be rectified by arteriotomy of the superior mesenteric artery rather than by the disastrous sacrifice of all or most of the small intestine. The tip of the catheter should be placed at the level of the lower border of the 12th lumbar vertebral body for the injection.

I have gotten a bit off the subject, but I want to emphasize that patients having intestinal colic without demonstrable objective signs might have a cancer of the body of the pancreas, or possibly an impending occlusion of the superior mesenteric artery.

It would be nice to hear if Dr. Dreiling has used the secretin method to study recovery of function of the pancreas after total gastrectomy. That should prove to be an interesting and profitable study. In dogs after total gastrectomy, the pancreas seems to shrink somewhat, yet histologically the acinar tissue of the pancreas seems quite normal. One may well wonder what digests the food after total gastrectomy. The patients have a little difficulty for a time, but if urged to eat, in time they do very well without the stomach. After approximately

3 years, of course, Vitamin B_{12} must be given to combat the megaloblastic anemia which supervenes regularly after total gastrectomy.

Pavlov described cephalic, gastric and intestinal phases of gastric secretion. We know that Pavlov was driven out of the field of the study of digestive secretions by the startling work of Bayliss and Starling, who, in 1902, demonstrated that pancreatic secretion was essentially a hormonal phenomenon. Actually this was the first hormone described. Prior thereto, Pavlov and his pupils had felt that this was essentially a nervous phenomenon. It was then that Pavlov left the alimentary tract and began to devote himself to a study of conditioned reflexes.

Some of you will recall that Wertheimer and LePage, Belgian observers, had insisted that after denervation of the pancreas there was no pancreatic secretory response. Bayliss and Starling made a preparation of hydrochloric acid with duodenal mucosa, adjusted the pH to neutrality and injected the resultant solution intravenously, and observed the type of response Dr. Dreiling reported to us today with commercial preparations of secretin. In addition to studying pancreatic secretion in patients with secretin after total gastrectomy, it would be interesting to see too, after antrectomy in the Billroth operation combined with vagotomy what the response from the pancreas is. Is fat absorption normal? How does such a procedure affect pancreatic secretion as contrasted with total gastrectomy? Loss of gastric secretion should certainly reduce the capacity of the pancreas to secrete pancreatic juice, whether the influence is mediated through gastric juice or the vagus nerves. The important question is where does the pancreas get its stimulus when both of these influences are missing.

It would be interesting to know, whether after all, Pavlov was in part right. —It is to be regretted that Pavlov left this field. In conditioned reflexes as well as in every department, the work that Professor Pavlov and his associates did, was marvelous.

These questions are of great interest to surgeon and physiologist. I hope Dr. Dreiling will continue exploring these important avenues of vital information. You will want to join me, I know, in congratulating him on a very nice paper.

Dr. I. Snapper:—I am happy to pay a warm and sincere tribute to the work of Dr. Dreiling and his associates. For many years I have been in a position to follow Dr. Dreiling's valiant efforts to shape the administration of secretin to a reliable clinical test. The tenacity of Dr. Dreiling and the continuous encouragement of Dr. Colp have ultimately resulted in the highly interesting results Dr. Dreiling has just presented to us. My role in this whole procedure was limited to consoling Dr. Dreiling occasionally,—sometimes even to consoling his patients. Thus, I am happy to congratulate him upon the solution of a difficult but a highly interesting problem.

Dr. Dreiling:—Thank you very much for the kind comments.

We now do have a preparation in America which is excellent and with which I have had no reactions in the last 800 cases. This is the Eli Lilly preparation of secretin which is available to the American profession and to physicians abroad as a public service of the Eli Lilly Company.

The whole problem of gastrectomy, vagotomy, and the dumping syndrome in patients who have had resections of the stomach for ulcer is a very fascinating one. Only some of the questions posed on this subject can be answered.

First, as to vagus section, I have studied at least 20 patients who have had total vagal interruptions. The response to secretin appears to be unaltered by section of the vagus nerve. As for total gastrectomy, I have had the opportunity to intubate seven patients who had total gastrectomies. In all seven patients, the pancreatic response to secretin was normal.

Finally, in the study of patients with persistent complaints following gastrectomy—complaints including the dumping syndrome, steatorrhea, abdominal pain, diarrhea, and inability to gain weight—the tendency to implicate the pancreas is, naturally a very tempting one. I have had the pleasure or misfortune to be asked to intubate some of these patients. This is not always possible because it implies passing a tube through a gastroenterostomy and entering the proximal loop, a maneuver which can be done in only about 50 per cent of the patients. In 21 such patients, intubation was successful. The pancreatic response to secretin was normal in two-thirds of this series, but, in one-third, there was definite evidence of pancreatic fibrosis. Whether this pancreatic fibrosis existed prior to gastrectomy and the ulcer represented a response to a loss of buffering power in the duodenum, as has been suggested by some gastroenterologists, or whether the pancreatic fibrosis represents a physiological response to the alterations in digestions which occur following surgery or even a response to trauma which occurred at the time of surgery, is difficult to determine. The fact remains, at least one-third of the patients studied with the secretin test technic show some evidence of pancreatic functional impairment following gastrectomy.

Dr. Wangensteen:—This impairment, I take it, followed Billroth II?

Dr. Dreiling:—I have studied only one Billroth I case. The Billroth I operation is only done occasionally in recent years at Mt. Sinai. Thus, there has been little chance to determine whether pancreatic functional impairment is less after this operation than after the Billroth II.

Dr. Wangensteen:—One other question: Perhaps I failed to make myself as clear as I should have. What sort of a dependency relationship is there in the epithelial cells of the duodenum which elicits the secretin response from the acinar cells of the pancreas? Obviously, these cells must be responsive, in some measure to stimuli other than the vagus or gastric juice. How otherwise does the pancreas get the stimulus to secrete in the absence of the vagi nerves and the stomach? From bile? Probably. From *succus entericus*? Perhaps. From other

sources of nervous excitation? Possibly so. These are questions which still need to be elucidated.

Dr. Dreiling:—The point is very well taken because those who would implicate the pancreas as a cause of digestive disturbance following gastrectomy, partial or complete, do so with the suggestion that by-passing the duodenum in the ordinary Billroth II reconstruction or in total gastrectomy in which the reconstruction involves a loop of jejunum, reduces the amount of endogenous secretin formed. Most of the secretin produced normally is stimulated by the impact of foodstuffs in the duodenum.

There is experimental evidence to support your idea that there is a diminution of production of secretin in these patients and further that even with a functionally capable pancreas following gastrectomy, there is, in fact, a functional deficiency of the pancreas.

VISCERAL MANIFESTATIONS OF OCCLUSIVE DISEASE OF THE INTESTINAL BLOOD VESSELS*†

GERALD H. PRATT, M.D., F.A.C.S.

New York, N. Y.

Introduction

The obstruction of the major blood supply and its drainage to and from any part is a serious and often fatal lesion if not corrected. Vascular occlusion differs from the interference with nerve, muscle or lymphatic supply to the part. These latter may cause partial or complete failure of function. Vascular occlusion, however, is followed by death of the part from which the circulation is interrupted unless the obstruction is overcome or sufficient collateral supply is present. When such a circulation failure occurs in the brain, hemiplegia or death may follow. If the coronary or renal arteries are completely blocked there will be a fatal outcome. When the major vessel supply to an important segment of the bowel is blocked, not only does that section of the bowel no longer function but secondary obstruction, perforation, peritonitis and death often is inevitable. There has been no more authoritative summation of the knowledge of this subject than by the Surgical Coordinator and Co-chairman, Dr. Owen H. Wangensteen in his book, "Intestinal Obstruction" now in its 4th edition. The primary *arterial* obstruction results from mesenteric thrombosis or embolism of the intestinal arteries. The *venous* vascular obstruction often is secondary to some intestinal disease which in most cases is of inflammatory origin. It may also follow an anatomical block, the circulatory effect being secondary to the impaired mechanics which follows the obstruction to the passage of the intestinal contents. A similar but more insidious obstruction can be initiated by occlusion of the vessels on the venous side.

Fortunately, mesenteric thrombosis is rare, only 5 per cent of all intestinal obstructions at St. Vincent's Hospital are due to this disease[1]. The early reports of this condition were derived from autopsies because the patients uniformly died of their disease. Only 4 per cent of the venous mesenteric occlusions are diagnosed preoperatively[2] (Table I).

Etiology

Mesenteric thrombosis may be primarily due to obstruction of the arterial inflow or venous outflow of the mesenteric vessels. It may be due to intestinal

*Presented before the Course in Postgraduate Gastroenterology of the American College of Gastroenterology, New York, N. Y., 18, 19, 20 October 1956.

†From the Surgical Service and Vascular Clinic of St. Vincent's Hospital and New York University College of Medicine.

obstruction, as if the obstruction persists long enough vascular occlusion occurs. This discussion is limited to the primary vascular obstructions.

Age:—Most mesenteric lesions occur between the ages of 30 and 70 years (Table II) with the average of reported series being 43. In our own series, however, the average was 60. Children are reported as rarely affected, but with more children being operated, this is changing. The shunt operation for portal hypertension was a source for one of our hospital thromboses. Males have such occlusions more often than females in a ratio of 3 to 2 (Table III). Only 2 per cent of intestinal obstructions are due to mesenteric vein obstruction.

Fig. 1—Gangrene of the bowel following a mesenteric arterial occlusion.

Arterial Obstruction:—Mesenteric arterial thrombosis occurs more often than embolism, although there is some question as to the exact figure of incidence (Table IV). Larson found thrombosis more common[3]. Trotter, whose original report on 360 collected patients in 1913 brought this subject to the forefront, stated that 63 per cent of the mesenteric arterial occlusions were due to embolisms (Table V). In some cases, both the arterial and venous sides are obstructed and if the condition persists long enough both arterial and venous occlusions are to be expected[4].

a. Embolism:—In the patients in whom there is an embolic occlusion from the heart there will be antecedent left-sided heart disease of the rheumatic type complicated usually by an auricular fibrillation. To the above picture often is added a coronary occlusion, a surgical operation or an obstetrical delivery which acts as a precipitating cause. For emboli to lodge in the intestinal vessels, however, is unusual. Of 85 emboli from 250 causes of endocarditis the superior mesenteric artery was involved only three times[5]. One of our patients had embolism as the source. When embolism occurs, the superior mesenteric artery most often is affected since it is the terminal and larger branch of the abdominal aorta. The inferior mesenteric artery is more rarely involved. Since the patient often can survive an occlusion of this latter vessel by the adequate

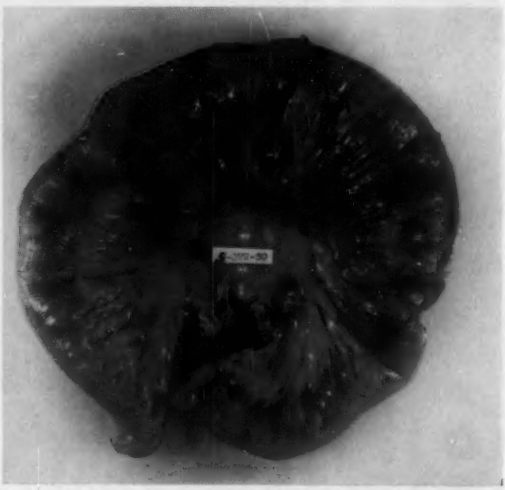


Fig. 2—Infarction small bowel following a mesenteric vein occlusion.

collaterals a complete intestinal obstruction rarely follows. Obstruction of the arteries of the colon is more rare. In their report of excision of the left colon, Dufour and Cabanie[6] found only 16 such infarctions of the arteries of the left colon reported in medical records.

b. Thrombosis due to trauma:—Direct or indirect trauma of the abdomen causes thrombosis of the mesenteric vessels. This may be the result of a direct blow or twisting type of trauma or it may be caused by the clotting secondary to the hypotension accompanying shock. The diagnosis in this latter state may not be made prior to operation. The mesenteric vessel may be traumatized by a surgical operation either accidentally by laceration or clamping or by a poorly placed retractor, a long exteriorization of the bowel or an inadvertent tear of the mesentery with secondary thrombosis.

c. Thrombosis due to arterial disease:—While arteriosclerosis or thromboangiitis obliterans may affect any artery including the mesenteric arteries, the complete occlusion of the bowel artery by these diseases is rare. More often the arterial occlusion occurs at the origin of the involved vessel at the aorta. There appears to be, however, a compensatory mechanism which preserves most of these vessels from occlusion even in advanced arterial disease just as the occlusion of the renal vessels by these diseases is seldom seen.

d. Aneurysm:—Arteriosclerosis is the most common cause for aneurysm. Usually the thoracic or abdominal aorta is involved. Aneurysm most often in-

Fig. 3—Mesenteric thrombosis due to occlusion of both the artery and vein.

volves the aorta below the renals or above the celiac plexus, although the author has seen nearly every visceral vessel involved by aneurysm. Syphilis was a common cause in the past, and on rare occasions now causes an aneurysm. Modern therapy of this disease makes the syphilitic aneurysm rare. It should be considered, however, in every differential diagnosis of aneurysms.

e. Distention:—Distention of the intestine in itself can cause blood vessel occlusion on both the arterial and venous sides. Thus, an intestinal obstruction of the closed loop type can result in so much trapped gas that the circulation shuts off. Dragstedt[7] showed that when the intraintestinal pressure of a loop of

bowel reached 60 mm. of Hg. the arterial supply to it could be shut off. An intraenteric pressure of 70 mm. of Hg. will prevent the filling of intestinal vessels even when they are intact[8]. Any intraintestinal pressure of over 10 mm. of Hg. interferes to some extent with the intestinal vessel filling at the capillary level[8].

Venous Obstruction:—The mesenteric thrombosis caused by venous obstruction is probably much more common than we know. Trotter reported that 40 per cent of his 360 cases collected from the literature were due to venous obstruction (Table V). A more recent study[9] in 1953 found that more mesenteric thromboses were due to venous occlusion than arterial blocks. The occurrence of both arterial and venous occlusion must be remembered[10].

a. Infection of organs draining to portal system:—Mesenteric venous obstruction usually follows infection of organs draining into the portal vein. Thus

TABLE I

St. Vincent's Hospital
18 Patients with Mesenteric Thrombosis

Mortality

	Death	*Recovery*
Arterial	8(27.3%)	3(72.7%)
Venous	3(42.8%)	4(57.1%)
Totals	11(61%)	7(39%)

appendicitis, liver and portal disease and ulcerative colitis are frequently antecedent causes.

b. Thrombosis due to trauma:—Thrombosis may be due to direct or indirect trauma to the abdominal wall or organs. Surgical operation with venous pressure may be the cause especially with the prolonged operation time necessary in today's massive surgery.

c. Thrombosis due to distention:—The venous obstructions may follow adhesive bands, intussusception and strangulated herniae (Table V). Adynamic ileus may cause venous obstruction due to stasis in the vessels. Venous obstruction to some extent, probably occurs in all prolonged surgical operations and this possible cause should be kept in mind with the lengthy operations which now are performed.

d. Thrombosis due to venous disease:—Patients with migratory phlebitis may have bowel vein involvement. This may be minor or may propagate to a massive venous thrombosis. One of our patients had had two bowel resections for this lesion before the age of 21. Some patients are known clotters just as

there are bleeders such as hemopheliacs. Much more study is necessary for us to be able to screen these patients. The above mentioned patient is such a one as is her mother, who has had recurrent phlebitis for 20 years with multiple pulmonary emboli.

e. Idiopathic obstruction:—There are those venous obstructions, however, in which no cause is found, idiopathic or agnogenic, as Dr. Wangensteen calls them.

f. Smoking may be a definite factor.

Pathology

In mesenteric arterial occlusion, the pathology depends upon the size of the vessel and the length of time it is obstructed unless only a small branch

TABLE II

Etiology of Mesenteric Thrombosis

Average Age	
43	Dr. Wangensteen
60	Our Series
Sex	
Male 3::2	Dr. Wangensteen
Equal	Our Series

is involved. In the superior mesenteric vessel, infarction of the wall follows the artery closure (Table VI). The artery becomes spastic as do the collaterals. In the embolism cases the spasm fixes the embolus. Gosset[11] as well as Allen and MacLean[12] demonstrated the part spasm plays in the progression of the arterial pathology. More recently Laufman and Method have registered the degree of spasm by the temperature of the bowel and they can predict by this method whether the bowel will be visible or not in most patients. If the spasms caused by the occlusion of the vessel relaxes and the branch still can recover its continuity of circulation, a reactive hyperemia occurs. Lewis[14] states this is due to the flow of blood into an avascular area. With the arterial occlusion, venous occlusion follows. The blood flows from the arterial capillaries into the venuoles and venous congestion becomes greater as the arterial ends of the capillaries empty[7]. The spasm continues until recovery of circulation is no longer possible. The spasm then relaxes and the blood leaks back from the venous end of the capillaries.

Infarction then develops and its extent depends on the length of time the obstruction persists. With infarction comes edema, coldness and loss of normal bowel color. Peristalsis stops. The involved bowel fills with fluid and trapped gas. The demarcation line appears. This may be sharp or there may be unhealthy, but

not gangrenous, tissue at the edges. Gangrene then occurs with perforation and peritonitis (Table VI). Wangensteen reported that in 60 cases of embolism of the superior mesentery artery, 45 had hemorrhagic infarction[15]. In the superior mesentery artery, occlusion due to thrombosis, the pathology may be similar, again dependent upon the degree of suddenness of the occlusion. If the occlusion is very slow as in some patients with arteriosclerosis, the collateral vessels may be sufficient or may dilate enough to carry the circulatory load.

If the inferior mesenteric artery is involved alone there may not be infarction. The author has seen many patients with occluded inferior mesenteric arteries due to occlusive arterial disease without signs of bowel obstruction. In the arteriosclerotic patients there may be all degrees of calcification or plaque formation. This occlusion may be partial or complete. The calcification may start at the aorta and be part of that organ's disease or it may be confined to the more distal vessels. In aneurysm, the arterial wall will balloon out with a

TABLE III

St. Vincent's Hospital
18 Patients with Mesenteric Thrombosis

Age	*Sex*
Youngest 7	Female 9
Oldest 94	Male 9
Average 60	

true or false aneurysmal sac formation. This sac may be the weakened wall or it may be formed by laminated clots and/or the contiguous walls (Table VII).

Thromboangiitis obliterans:—This disease is a rare cause for arterial occlusion. There may have been reported occlusions of the mesenteric arteries[16]. The occlusion often may be in smaller vessels with recanalization and recovery. The vein may be occluded in this disease in a similar manner to the phlebitis that accompanies one of every three patients with the Buerger artery syndrome of the legs. Allen[17] mentions the rarity of mesenteric artery involvement in this disease.

Venous mesenteric occlusion:—In the venous mesenteric occlusions secondary to infections of bowel or liver disease, the pathologic picture includes that of the primary disease, i.e. appendicitis, hernia, ulcerative colitis, etc.

Clinical Manifestations

While some mesenteric vascular occlusions are slow and insidious in origin the acute embolic closures usually are dramatic, shocking episodes. The antecedent signs most often are those of a patient with rheumatic heart disease

history and auricular fibrillation. The signs of vascular obstruction begin with the embolic lodgement. Since the superior mesenteric artery is most often involved, the abdominal signs most often are generalized in location.

Pain:—The pain is an acute and severe one. It persists and may not be localized until the condition is advanced. In the insidious type it may be only moderate for a long time.

Vomiting:—Vomiting accompanies the pain and this will be persistent. The vomiting may be recently ingested food followed by bile. Later, the vomitus may be wine-colored or grossly bloody due to intraintestinal hemorrhage.

Diarrhea:—Diarrhea is a frequent symptom. Constipation has been observed but a loose stool is the usual picture. The diarrhea may become bloody (14 per cent) in type and in such cases it is highly suggestive of the lesion.

TABLE IV

St. Vincent's Hospital
18 Patients with Mesenteric Thrombosis

Type Occlusion		*Days After Onset*	
		Arterial	Venous
Arterial	11	Longest 7	Longest 10
Thrombosis	10	Shortest 1	Shortest 1
Embolism	1	Average 3	Average 7.4
Venous	7		

Shock:—Shock is an early sign in a large mesenteric vascular occlusion. This shock is due in part to the loss of blood into the bowel and peritoneal cavity[15]. The sudden occlusion of any large artery in itself, however, may cause shock without blood loss. This shock is on a reflex sympathetic basis. Both mechanisms may be the cause of the shock.

Temperature:—With shock the temperature is subnormal or normal and usually, but not always, is not elevated until peritonitis develops, when it will rise as the peritoneal inflammation increases.

Pulse:—The pulse becomes rapid and sometimes irregular. It may be very rapid as the peritonitis develops and also rises with the blood loss into the bowel lumen and the peritoneal cavity.

Distention:—Distention of the abdomen develops slowly. It, however, will progress. With it comes an increasing cramp-like type of pain. The distention, at first, is in the bowel deprived of its blood supply. Later, the small and large bowel, both, become distended.

Roentgen rays:—The early x-ray picture may be that of an ileus, but soon the loop obstruction picture intervenes. There will be distention and fluid waves at first in the involved small bowel but later in other areas of small and large bowel there will be a loss of haustration. A P, lateral and oblique views in supine and upright positions will aid in the diagnosis by x-ray picture. The intestinal tube, while helpful, may further delay definitive therapy.

TABLE V

ETIOLOGY OF MESENTERIC THROMBOSIS

1. Arterial 60%
   a. Embolism Rare—One in Our Series
   b. Thrombosis Due to: Trauma; Arterial Disease; Idiopathic
   c. Aneurysm Due to: Arteriosclerosis; Syphilis—Rare
   d. Distention Plus 60 mm. Hg. ⟶ Arterial Occlusion
2. Venous 40%
   a. Infection of Organs Draining to Portal System
      Appendicitis
      Liver and Portal Disease
      Ulcerative Colitis
   b. Thrombosis Due to Trauma: Direct; Indirect; Operation
   c. Thrombosis Due to Distention
      Adhesions
      Intussusception
      Strangulated Hernia
   d. Thrombosis Due to Venous Disease
      Phlebitis
      Clotters
   e. Idiopathic — Agnogenic

LATE MANIFESTATIONS

At a later time the pain may subside but the distention will continue. With gangrene of the bowel comes perforation and the hyperperistalsis is replaced by the silent abdomen. Perforation will cause further shock and often a rapid deterioration in the patient's status.

Slow Onset

In the slow arterial occlusions as well as in the mesenteric vein blocks, the course may be mild for some time. The vascular occlusions of this type are not complete at first. In one series of 21 cases, the percentage of patients running a course of eight or more days was equal to those with less than an eight-day history[18]. The vascular occlusion may be so slow as to not show signs of mechanical obstruction until viability of the bowel is lost and perforation occurs. Visible peristalsis was seen in only 4 of 360 cases[4]. Abdominal tumor was felt in 5.6 of the above series.

Laboratory Findings

Leucocytosis is usual and early with a sharp shift to the left in the percentage of premature poly cells. The blood count will show a decrease in RBC

TABLE VI

Pathology Mesenteric Thrombosis

	Early	
Occlusion Plus Spasm		Avascularity
Spasm Relaxes		Venous Back Flow
Infarction	Edema Coldness Color Changes	
	Late	
Peristalsis Stops		
Distention Continues		
Gangrene		
Perforation	Peritonitis	Death

and Hgb. as will the hematocrit with hemorrhage. The urinalysis shows only concentration with the dehydration unless the renal arteries are involved or later shut down. Blood chemistry signs of intestinal obstruction are late. These changes, when present, usually indicate irreversibility. Such findings are indicative of imminent death and not of bowel obstruction.

In the venous occlusions, the amount of bowel hemorrhage usually is greater due to the venous congestion following venous infarctions. Wine-colored diarrhea and/or vomiting will change to gross hemorrhage which may be severe. The peritoneal contents will be bathed in bloody fluid. Characteristically the mesenteric fluid will be seen as a bluish swelling, ballooning the peritoneum before this latter cover is opened at operation time.

Differential Diagnosis

The correct diagnosis in mesenteric thrombosis is one of the most difficult ones with which we are faced. It is rare for the diagnosis to be made and if it is suspected and if the diagnosis of "acute abdomen" is made, a successful approach to the problem has already been accomplished (Table VII). In Trotter's 360 patients, only 13 were correctly diagnosed prior to operation. In the venous thrombosis, the diagnosis is even more difficult to make. In patients in whom there have been arterial or venous occlusive diseases, the condition may be suspected. In two of our patients, previous mesenteric thrombosis, successfully treated surgically, led to a suspicion of the lesion and an early diagnosis. The tendency to intravascular clotting on either the venous or arterial side should make one suspect the lesion earlier than in those in whom such antecedent vascular pathology does not exist.

TABLE VII

Clinical Manifestations of Mesenteric Thrombosis

	Late	
Less Pain		Peritonitis Signs
Continued Distention		Perforation Signs
Silent Abdomen	Deterioration	Death
	Early	
Pain		Rapid Pulse
Vomiting		Distention
Diarrhea		X-ray Picture
Shock		Chemical Changes

Intussusception:—Symptoms of intussusception are similar to those of a mesenteric thrombosis. Differential points, however, are: intussusception is a disease of the young and mesenteric thrombosis is that of the middle or older age group. The abdominal tumor so often present in intussusception and the intermittent colic pain is in contrast to the continuous pain of mesenteric thrombosis[15].

Embolism:—A patient who has had rheumatic heart disease and does have or has had auricular fibrillation is often a candidate for mesenteric thrombosis of the embolic type.

Venous mesenteric thrombosis:—In the venous thrombosis, an inflammatory disease of those organs emptying into the portal system may give a clue as to the possible mesenteric thrombosis. In addition, insidious onset with continuous signs and symptoms without a diagnosis should lead one to suspect the condition.

Pancreatitis:—Acute, subacute and chronic pancreatitis signs and symptoms are quite similar to those of mesenteric thrombosis. The differential diagnosis is quite difficult to make. In the acute stage, the high serum amylase will give a clue to the diagnosis.

Perforation of the stomach or bowel:—The acute, and particularly the subacute and chronic perforations of the bowel, will have signs and symptoms similar to that of mesenteric thrombosis. Elimination by careful follow-up x-ray studies and the history, may be the only way of making a diagnosis. An exploration in any case of questionable perforation is indicated. A negative exploration in such instances should be considered a satisfactory outcome, much preferable to finding the extending and malignant type of late mesenteric thrombosis. Wangensteen[15] reports that 50 per cent of the 45 patients with mesenteric infarction at the University of Minnesota Hospital waited over a week before they were admitted.

Wangensteen's review of the 45 patients and their symptoms as they were presented, is worthy of note. They are as follows:

Vomiting	74%
Abdominal tenderness	91%
Rebound tenderness	76%
Bowel sounds decreased or absent	42%
Fever	41%
Leucocytosis	90%

The needle or a suction tip aspiration of a blood intraperitoneal fluid is a consistent finding and of diagnostic value as he teaches.

Treatment

There have been instances in which recovery has occurred spontaneously. Some patients who have had signs and symptoms of mesenteric thrombosis were not operated and made a recovery. In one instance, in our institution, such a patient was operated after a series of symptoms similar to those which had been observed at a previous admission and mesenteric thrombosis was found and surgically eradicated. There have been reports where the entire bowel has been found cyanosed at the operation and the patients recovered without further therapy[19-24]. These were incomplete occlusions.

After the first reported success in 1895 of operative intervention by Elliot[24], only 4 recoveries were reported in 47 patients detailed in 1904 by Quinby et al[18]. In the next 17 years, 24 patients survived operation and by 1931, 39 had recovered of the 92 operated.

The seriousness of the disease is well emphasized by the 1953 report of Mersheimer, Winfield and Fankhauser of 38 patients. In 17, no operation was performed and each one of these died. In 21 patients operated, 9 were not resected of which 8 died and of the 12 patients resected, 5 died[9].

The problem apparently is that of deciding which part is viable and which is not. Where there is a question as to whether the bowel will survive or not exterioration may be life-saving and is advocated instead of anastomosis where the ends of the bowel are questionably viable. If the viability line is definite, excision and an anastomosis should be performed.

Anticoagulant theory:—Most experimental animals will survive venous mesenteric obstruction if they are heparinized. This prevents the propagation of clot and collateral arterial and venous circulation is able, therefore, to carry on after the obstruction. This therapeutic measure should be utilized. In our own patients, any one who survives a mesenteric thrombosis is put on anticoagulant therapy and kept on it for an indefinite time and probably even a life-time. In our vascular clinic, where we use ambulatory anticoagulant therapy, four patients have been on anticoagulant therapy for from three to eight years following massive mesenteric thrombosis and resection with recovery. One patient had two episodes of mesenteric thrombosis and gangrene. One patient who is only 21 has had approximately 14 feet of her bowel resected. She is of a clotting type family that has had repeated attacks of venous thrombosis and her mother has had multiple thrombophlebitis attacks and pulmonary embolism. Sometimes commissurotomy is needed to prevent recurrent embolism.

The question of how many feet of bowel can be excised has been raised many times. Apparently, 50 to 60 per cent of the small intestines can be excised but over 85 per cent is poorly tolerated. Resection of large amounts of bowel, however, done in stages, can be tolerated and this has been reported by many surgeons. The problem of dietary regime and diarrhea which usually follows and the disturbance in the absorption of fat is a problem which causes serious management difficulties postoperatively.

Analysis

Twenty-one patients studied for such defects at St. Vincent's Hospital of the City of New York had this lesion since 1951 and 18 patients' charts were analyzed. It was necessary to place a personal interpretation upon some figures but, in general, these essentially are correct.

These 18 patients ranged in age from 7 to 94 years. Their average age was 60 which is higher than usual because 4 of the patients were over the age of 74. There was an equal distribution between the two sexes. The type of vascular occlusion causing the mesenteric thrombosis was interpreted to be arterial in 11 cases (61.1 per cent) and venous in 7 (30.9 per cent). The arterial occlusions

were thrombotic in all but one which was caused by an embolus in a patient with rheumatic heart disease and auricular fibrillation. The days before operation after the onset the arterial occlusions varied from one to seven and averaged three. The diagnosis of venous occlusions ranged from one to ten days and averaged 7.1 days. Of the 11 arterial occlusions operated 8 died (72.7 per cent). From 5 to 25 feet of bowel were resected in the patients. One patient had a resection of all the small bowel from 5 inches below the ligament of Treitz and survived 80 days. This patient* made a surgical recovery but died of his generalized heart disease complicated by the problem created by the loss of the small bowel. The patients who recovered were operated promptly.

Four of the seven patients with venous thrombosis recovered. This surprisingly high figure was accounted for by the fact that one of these patients had had a previous mesenteric vein thrombosis which directed the attention of the surgeon to this diagnosis immediately. Two other patients had had a history of repeated clotting episodes and the diagnosis was suspected on admission. These diagnoses and recoveries suggest that in the questionable acute abdomen exploration be performed early especially if there has been pathologic venous clotting in the patient previously.

In the future, embolectomy for embolic mesenteric occlusion will be used more often and will reduce the mortality. It is indicated in any patient who is fibrillating and has signs of mesenteric occlusion.

Conclusions

1. Mesenteric thrombosis of either arterial or venous origin is a highly lethal disease because of the difficulty in diagnosis.

2. The arterial occlusions, although more apparent are still diagnosed relatively late.

3. Venous thrombosis is more innocuous in onset than the arterial. It should be suspected in patients with vague abdominal symptoms if there is a history of pathologic clotting.

4. Long and extensive operative procedures add to the problem of mesenteric thrombosis. The more common causes, however, remain arterial disease, infections of organs draining into the portal system and distention.

5. Since exploration, even if negative, is not a serious problem and since diagnostic delay maintains the high mortality, laparotomy is indicated in patients with vague but continuing signs of obstruction of a subacute acute abdomen.

6. We faced the same problem surgically with cardiac arrest. Surgeons were afraid to open the chest and find that the heart was beating. That is exactly

*Patient of Dr. L. M. Rousselot operated by Dr. W. Wolff.

what is desired. In like manner in these questionable cases more explorations are required. If they are negative the patient will not die. If they are positive for mesenteric thrombosis many more will live.

7. Larger amounts of small bowel can be resected with survival now.

REFERENCES

1. Rousselot, Louis M. and Haggstrom, G. A.: Acute intestinal obstruction. S. Clin. North America **30**:479, 1950.
2. Brown, M. J.: Mesenteric venous occlusion. Am. J. Surg. **49**:242, 1940.
3. Larson, L. M.: Mesenteric vascular occlusion. Surg. Gynec. & Obst. **53**:45, 1931.
4. Trotter, L. B. C.: Embolism and Thrombosis of the Mesenteric Vessels. Cambridge University Press, 1913.
5. Ginsberg, quoted by Trotter.
6. Dufour, R. and Cabanie, H.: Les infarctus du colon gauche. J. Med. Bordeaux **129**:269, 1952.
7. Dragstedt, C. B., Lang, V. G. and Millet, R. F.: Relative effects of distention on different portions of intestine. Arch. Surg. **18**:2259, 1929.
8. Noer, Rudolf J. and Derr, John William: Effect of distention on intestinal revascularization. Arch. Surg. **59**:542, 1949.
9. Mersheimer, W. L., Winfield, J. M. and Fankhauser, R. L.: Mesenteric vascular occlusion. Report of five successful resections. Arch Surg. **66**:752, 1953.
10. Johnson and Baggenstoss quoted by Trotter.
11. Gosset, A., Bertrand, I. and Patel, J.: Ann. anat. path., par., **9**:841, 1932.
12. Allen, E. V. and MacLean, A. R.: Proc. Staff Meet., Mayo Clinic, **10**:216, 1935.
13. Laufman, H. and Scheinberg, S.: Arterial and venous mesenteric occlusions. Am. J. Surg. **58**:84, 1942.
14. Lewis, T.: The Blood Vessels of the Human Skin and Responses. London, Shaw & Sons, Ltd. 1926.
15. Wangensteen, Owen H.: Intestinal Obstructions, Physiological, Pathological and Clinical Consideration With Emphasis on Therapy, Including Description of Operative Procedures. Charles C. Thomas, Springfield, Ill., 1955.
16. Meyer, H. W.: Acute superior mesenteric artery thrombosis. Recovery following extensive resection of small and large intestines. Arch. Surg. **53**:298, 1946.
17. Allen, E. V., Barker, N. W. and Hines, E. A.: Peripheral Vascular Diseases. W. B. Saunders, Philadelphia, 1955.
18. Jackson, J., Porter, C. and Quinby, W.: Mesenteric embolism and thrombosis, a study of 214 cases. J.A.M.A. **42**:1469 and **43**:25, 1904.
19. Ochsner, A.: Discussion of paper by Douglas: Trans. Am. Surg. Assoc. **53**:155, 1935.
20. Laws, G. M.: Mesenteric thrombosis. Ann. Surg. **64**:378, 1916.
21. Deaver, J. B.: Quoted by Ross, G. G.: Mesenteric thrombosis with a report of 6 cases. Ann. Surg. **72**:121, 1920.
22. Jopson, Discussion of Rothschild's paper. Rothschild, N.: Safety factors in mesenteric ligations. Ann. Surg. **89**:78, 1929.
23. Klein, E.: Embolism and thrombosis of the superior mesenteric artery. Surg. Gynec. & Obst. **33**:385, 1921.
24. Elliott, J. W.: The operative relief of gangrene of the intestine due to occlusion of the mesenteric vessels. Ann. Surg. **21**:9, 1895.

DISCUSSION

Dr. O. H. Wangensteen:—It is very appropriate that a general surgeon with Dr. Pratt's very special interest in vascular surgery should have been selected to give a dissertation on the subject of occlusive diseases of the mesenteric

blood vessels. You will agree, I am certain, that Dr. Pratt has covered the subject exceedingly well.

In one area of Dr. Pratt's own special interest, a complication occurs occasionally after placement of a homograft in the aorta, which deserves mention. Instances have been reported in which a perforation in the lower colon or rectum has attended the interposition of an aortic graft. This occurrence is owing undoubtedly to occlusion of the internal iliac arteries.

Dr. Pratt has emphasized the great difficulty of making the diagnosis of mesenteric vascular occlusion. This difficulty is occasioned by the circumstance that many patients with mesenteric thrombosis do not appear very ill. I can recall seeing a patient some years ago on whom I had done a total gastrectomy a few years before, who was admitted to our hospital wards during my absence. The patient had an inlying duodenal tube down, but he was up shaving when I went to see him. His general well being had afforded our Resident assurance there could be nothing seriously the matter with the patient. Rectal examination disclosed a definite mass; the patient still had periodic intestinal colic. In any case, it was obvious that an operation was in order. When the belly was opened, a very foul smell was noticeable. There was a venous thrombosis of the greater portion of the gut. There was a gangrenous segment of the upper jejunum; approximately a third of the jejunoileum was viable. The remainder of the small intestine and the right half of the colon were gangrenous. We made two intestinal resections. The patient survived the procedure and left the hospital. Eight days later, he returned, obviously very ill. Dr. L. Kiriluk of Seattle (now on my surgical service), urged me to open the patient's abdomen on the thesis that there was a residual intraperitoneal abscess present. I failed to heed this suggestion. A few days later, the patient died. The only important postmortem finding was a right lateral gutter abscess. There was no fistula.

It was then that we began use of the socalled suction tip method of providing drainage of an intraperitoneal abscess. We use a tonsil type of 4 hole sucker with a long handle and an air vent as illustrated in my book on "Intestinal Obstructions" (C. C. Thomas Co., Third Edition 1955, Fig. 63, p. 300). A small subcostal slit in the abdominal wall is made. The long sucker permits exploration of one lateral half of the abdomen. If the findings are negative, we do it on the other side similarly. We do not need a big incision to explore the abdomen for an abscess.

Dr. Klass of Winnipeg has removed an embolus from the superior mesenteric artery; however, his patient died. Presently, we hope the diagnosis can be made early enough in arterial mesenteric infarction so the gut can be saved. We shall then be doing prophylactic surgery in preventing gangrene, rather than excising gangrenous intestine. I commented earlier in this program in the discussion of Dr. Dreiling's paper upon the possibility of detecting impending occlusion of the superior mesenteric artery in ageing patients having intestinal

colic without demonstrable findings. A scout film of the abdomen following the insufflation of approximately 700 c.c. of air into the peritoneal cavity suffices to afford objective evidence of the presence of venous intestinal strangulation, occasioned by the difference in density which ensues from hemorrhage into the intestine. This agency is not helpful in arterial mesenteric occlusions because there is little or no hemorrhage into the bowel. The significance of the blood loss factor in venous strangulations was nicely shown by Horace Scott in our surgical laboratories many years ago (*Proc. Soc. Exper. Biol. & Med.* **29**: 748, 1932).

When air is introduced (700 c.c.) the strangulated loop in venous occlusions can be distinctly seen as "sausages". A 15-gauge needle with a short bevel is introduced in one of the lateral quadrants of the abdomen and a polyethylene catheter is introduced through the needle which is then pulled out. The air is injected slowly, and the scout films are made of the abdomen. It is a simple technic which should result in an improved mortality rate because of earlier recognition of venous intestinal strangulations.

It would be good indeed if we could do as well with arterial intestinal strangulations. Arteriograms employing a catheter introduced through one of the femoral arteries should help to recognize arterial occlusion of the superior mesenteric artery. We have begun to work with this technic of trying to identify mesenteric arterial occlusions experimentally.

Dr. Pratt indicated that the mortality of venous mesenteric occlusions of the gut is not great. In our clinic it is about 11 per cent for the venous mesenteric infarction but for arterial mesenteric occlusions the mortality is about 70 per cent. As Dr. Pratt pointed out, here is an area within the bowel obstruction problem responsible for a large number of deaths. Elaboration of dependable diagnostic criteria should prove helpful in the recognition of the disastrous occurrence of arterial mesenteric infarction. If the disorder could be recognized before the gut is gangrenous, an arteriotomy on the superior mesenteric artery might save the patient his intestine as well as his life.

One of my associates, Dr. Richard Lillehei, has recently done a beautiful piece of work on the lethal factors in hemorrhagic shock. Lillehei finds that when the blood pressure is kept at a low level for a period of time, the dog will ordinarily die, even if transfused. Placement of oxygenated blood into the superior mesenteric artery, however, is followed by a high percentage of recovery. This observation would suggest that oxygenation of the gut in many states of low blood pressure may have great importance.

In discussing mesenteric thrombosis, one must ask himself: how much gut can be excised? You heard Dr. Pratt say they had excised practically all the small bowel in one case. Years ago, Doefler asked, "*Kann Mann ohne Dürm Darm leben?*" or, translated, "Can one live without the small intestine?" It con-

cerned a pharmacist 58 years of age in whom Doerfler excised all but 32 cm. of the small bowel. That patient was reported as well six years later. Most patients do not do well if one excises more than half of the small bowel. Arnold Kremen, one of my associates, found the ileum to be more important than the jejunum, because of its role in water absorption. If one has a choice between sacrificing a long segment of the ileum or jejunum, salvage of the ileum is to be preferred. In the presence of gangrenous gut, one does not often have much choice.

ANTIBIOTICS AND COLON SURGERY*

ISIDORE COHN, Jr., M.D., D.Sc.(Med.), F.A.C.G†

New Orleans, La.

Since the early use of antibacterial agents for preoperative preparation of the colon[13,14,16] debate has continued about the value of such therapy. In the period before antibacterial agents the morbidity and mortality of large bowel surgery were reduced by staging procedures, by decompressing the colon proximal to an anastomosis, by technics which permitted the bowel to be opened only after it had been exteriorized and sealed from the peritoneal cavity, by study of the differences in the circulation of the large and small bowel, and by the many contributions to the general improvement of surgical care. Certain studies without antibacterial agents[15] suggested that preoperative antibacterial agents would be of no additional benefit if careful surgical technic and preoperative mechanical cleansing were utilized.

Other studies suggest that antibacterial agents do have a role in lowering the morbidity and mortality of elective gastrointestinal procedures[1-5,11,12,18-20] and may even have a significant place in emergency colon surgery[17]. It is the purpose of this paper to evaluate the role of antibacterial agents in colon surgery by discussing three questions:

1. Is there any evidence that antibiotics are of value in colon surgery?
2. Is there any difference in the efficacy of various antibacterial agents?
3. What is the clinical application of this information?

The Role of Antibiotics

The uncomplicated postoperative course of the majority of cases of elective colon surgery eliminates clinical research as a rapid means of evaluating the role of antibiotics in colon surgery. It was therefore necessary to devise some experimental procedure which would make possible a study of colon anastomoses under abnormally severe conditions. When intraluminal antibiotics were shown to maintain viability of strangulated small bowel[2-4], it was decided to apply this principle to the colon[5,11,12].

The experimental procedure consisted of a one layer end-to-end anastomosis of the colon with complete devascularization of one side of the anastomosis.

---

*Presented before the Course in Postgraduate Gastroenterology of the American College of Gastroenterology, New York, N. Y., 18, 19, 20 October 1956.

†Department of Surgery, Louisiana State University School of Medicine, New Orleans, La.

Aided in part by Research Grants #E-524-C through #E-524-C2 from the National Microbiological Institute of the National Institutes of Health, Public Health Service, and by grants from the Lederle Laboratories Division, American Cyanamid Company.

A plastic tube was inserted into normal bowel and threaded so that its tip would deliver antibiotics to the anastomotic line. It had already been demonstrated that antibiotic protection, for bowel deprived of its blood supply, obtained from intraluminal antibiotics was superior to that obtained from parenteral antibiotics[2,3,4,20].

The work was divided into three experimental series:

1. No preoperative preparation[11].
2. Preoperative mechanical cleansing of the colon[5].
3. Preoperative antibiotics plus preoperative mechanical cleansing[12].

In each series there was a control group which did not receive postoperative antibiotic therapy but received other treatment identical with that in the treated series. With each successive means of improving preoperative cleansing of the colon, the length of segment to be devascularized was increased so as to maintain comparable stress upon the anastomotic line.

TABLE I

AGENTS FOR PREOPERATIVE PREPARATION

Not Recommended	Sulfasuxidine Sulfathalidine Aureomycin	Terramycin Chloromycetin Mysteclin	Achromycin Cathomycin Sterosan
Satisfactory	Neomycin	Sterosan-Neomycin	Enterobiotic
Preferred	Achromycin-Neomycin	Nystatin-Neomycin	Sulfathalidine-Neomycin

Cultures of the bowel lumen in each series indicated quite clearly that there was no difference in the bacterial flora of the control and treated groups in each individual series. It is interesting to note that mechanical cleansing did not alter qualitatively the flora of the bowel. There was no bacterial growth in those animals prepared with antibiotics in spite of the large masses of fecal material present in most of these experiments. This indicates that antibacterial therapy can eliminate bacteria from the colon even though fecal material is still present.

The control animals in Series I had devascularization of a 5 cm. segment on one side of the anastomosis[11]. All control animals died within 32 to 114 hours, with a median survival of 40.5 hours. At autopsy each animal had a foul-smelling purulent peritonitis from a perforation in the necrotic devascularized portion of the colon. In five experiments there was complete separation of the two segments of bowel from one another. In this, as in all subsequent experiments, the suture was intact and therefore the separation and perforation could not be

ascribed to breakage of the suture. These control experiments indicated that this technic would be suitable for evaluating methods of protecting colon anastomoses.

The treated group in Series I consisted of eight dogs which received postoperative antibiotics in the lumen of the bowel and parenteral penicillin for 168 hours. One treated animal died of extraneous causes, and one was found at autopsy to have devascularization of an excessively long segment. The anastomosis in the remaining six dogs was functioning and viable. In five of these the devascularized bowel could not be distinguished from adjacent normal bowel. Even the mucosal appearance was indistinguishable from adjacent normal mucosa.

Histologic examination of the strangulated segment removed from animals re-explored after a prolonged period indicated that the devascularized segment was essentially within normal limits.

The differences between the survival of control and treated animals and between the appearance of the colon in control and treated animals indicated that antibiotics could play a major role in improving the safety of elective colon surgery.

In Series II the animals were prepared for three days with starvation, laxatives, and enemas to provide mechanical cleansing comparable to that employed in patients for elective colon surgery[5]. These animals had devascularization of a 7 cm. segment on the distal side of the anastomosis. Controls received no postoperative antibiotics. The treated series received intraluminal antibiotics and parenteral penicillin postoperatively. Of ten control dogs, six died between 28 and 48 hours. These six all had a severe peritonitis due to perforation in the devascularized segment. Re-exploration of the four surviving animals revealed an apparently normal colon.

The treated group consisted of five dogs *all* of which survived to be re-explored one to ten weeks following the original operation. The colon anastomosis was viable and functioning in all. There was no detectable difference between the devascularized and the immediately adjacent normal serosa of the colon. Histologic study confirmed the normal condition of the bowel.

The difference in survival rates between the control and the treated series indicates the value of postoperative antibiotics even when preoperative preparation includes mechanical cleansing. The improved survival rate of this control group as contrasted with the control group in the series with no mechanical cleansing shows the advantage of mechanical cleansing alone.

In Series III the animals had three days of mechanical cleansing and antibiotic therapy[12]. These animals had a 10 cm. segment devascularized on the distal side of the anastomosis. Controls received no postoperative antibiotics

while treated animals received postoperative intraluminal antibiotics. The efficacy of preoperative antibiotics was demonstrated by the absence of bacterial growth in 16 of these experiments. The absence of bacterial growth was noted equally in the control and treated groups and did not appear to have any role in the difference in survival between the control and treated groups.

The control group consisted of 11 animals, nine of whom died between 52 and 192 hours. Two survived and each had an apparently normal colon at subsequent autopsy. Seven of the animals that died had peritonitis due to perfora-

TABLE II

CASES PREPARED WITH ACHROMYCIN-NEOMYCIN
1 JUNE 1955–1 JULY 1956

Colostomy closure	11
Abdominoperineal resection	9
Right hemicolectomy	9
Sigmoid colectomy	4
Colostomy, elective	3
Polypectomy	3
Transverse colectomy	2
Anterior resection	2
Left colectomy	2
Splenic flexure excision	1
Swenson pull-through	1
Total colectomy	1
Colostomy hernia	1
Diaphragmatic hernia	1
Miscellaneous, including exploration for suspected colon lesions, far advanced gastric carcinoma, etc.	16
Total	66

tions in the devascularized segment. Two animals died without perforations but did have changes in both mucosa and serosa of the devascularized segment.

The treated group consisted of 10 dogs of which three survived for two weeks or longer. Seven died between 37 hours and 9½ days. The cause of death in two was not apparent but five had perforations and frank peritonitis. The prolonged survival time with a severe peritonitis was ascribed to intensive pre- and postoperative antibiotic therapy. The differences in survival time between the control and treated groups were not as striking in Series III as in the preceding series but the differences in pathologic changes were sufficiently marked to indicate that postoperative antibiotic therapy would be of value following

preoperative mechanical cleansing and antibiotic preparation. It is thought that the 10 cm. segment selected for devascularization in this series either approaches or reaches the limit of devascularization which can be protected regardless of antibiotic therapy. The unfortunate choice of a segment that was too long to permit routine survival does not invalidate the importance of the basic idea advanced for postoperative antibiotics.

An evaluation of the importance of each of the three types of preoperative preparation utilized in this study can be gained from a study of the median survival of each control group. The increasing median survival with each additional means of preoperative preparation indicates that each method of preoperative preparation plays a role in improving the safety of elective colon surgery.

It is thought that the function of antibiotics under these circumstances is to inhibit bacterial growth long enough to permit the bowel wall to revascularize and heal. If the bacterial population can be controlled during the first 48 to 72 hours after anastomosis, sufficient revascularization can occur to permit the bowel to survive. Since the bowel in patients should not be devascularized, antibiotics should function in patients to aid healing of the anastomosis by inhibiting bacterial growth, and the edema and other reactions to bacterial overgrowth.

Thus, there are two times when antibiotics play a role in elective colon surgery. One is in reducing the bacterial population *prior* to surgery and the other is in maintaining a lowered bacterial flora *after* surgery. Both these experiments and the following antibiotic studies indicate that preoperative antibiotics do not inhibit bacterial growth beyond the first day following the cessation of drug therapy. Therefore, it would seem worthwhile to continue administering antibiotics in the postoperative period. In patients the oral route is contraindicated and impractical following bowel surgery. The parenteral route does not provide sufficient antibiotic concentration in the lumen of the bowel where its activity is required. Therefore, the use of the plastic tube inserted at surgery to provide for intraluminal antibiotic administration has been advocated.

Antibacterial Agents for Preoperative Preparation

A number of different agents for preoperative preparation of the colon have been compared under standard conditions of patient care and bacteriologic analysis to simplify comparisons between different agents[6,10].

Patients in good general condition without known lesions in the gastrointestinal tract were selected at random from the surgical service. The effect of the various antibacterial agents were similar in normal patients and in patients with colon lesions, except for those with partially or completely obstructing lesions.

Patients were placed on a low residue diet, were given a cathartic the first day of therapy, and were given enemas daily during therapy. A control stool was obtained prior to therapy, specimens were obtained daily during therapy, and at intervals thereafter.

Antibacterial agents for preoperative colon preparation have been divided into three categories (Table I):

1. Not recommended
2. Satisfactory
3. Preferred

Not recommended:—Aureomycin, administered 750 mg. four times a day for five days, provided unsatisfactory reduction of streptococci, bacteroides,

TABLE III

POSTOPERATIVE INTRALUMINAL ANTIBIOTICS

Colostomy closure	8
Polypectomy	5
Sigmoid colectomy	5
Transverse colectomy	3
Left colectomy	3
Right hemicolectomy	2
Anterior resection	1
Splenic flexure colectomy	1
Swenson pull-through	1
Total	29

clostridia, and coliform organisms[6]. The incidence of undesirable gastrointestinal side reactions was disturbing.

Terramycin, administered 750 mg. every six hours for five days, provided unsatisfactory control of coliform organisms, streptococci, and bacteroides[6]. The incidence of undesirable gastrointestinal complications was too high for routine use.

Achromycin was administered for five days 750 mg. six times a day[6]. There was inadequate control of streptococci and coliform organisms, questionable control of clostridia, and an apparent initial stimulation of staphylococci. Undesirable gastrointestinal complications were common.

Mysteclin was administered for five days according to the schedule Tetracycline 750 mg.—Nystatin 750,000 units four times a day[6]. There was inadequate control of streptococci, bacteroides, and coliform organisms.

Chloromycetin was administered 750 mg. four times a day for five days[10]. There was inadequate control of streptococci, staphylococci, coliform organisms, and bacteroides.

Cathomycin, 250 mg. every four hours for 72 hours, gave inadequate control of coliform organisms, bacteroides, and clostridia and only partial control of streptococci[10].

Sterosan was administered 100 mg. four times a day for 72 hours[9]. There was unsatisfactory reduction of the streptococci, coliform organisms, and bacteroides.

Sulfasuxidine, 6 gm. initially, then 3 gm. every four hours for 72 hours, provided inadequate control of the streptococci, coliform organisms, clostridia, and bacteroides[10]. The large number of tablets required is another undesirable feature.

Sulfathalidine, 2 gm. four times a day for five days, provided unsatisfactory control of streptococci, coliform organisms, and bacteroides[10].

Satisfactory:—Neomycin, 1 gm. every hour for four hours then 1 gm. every four hours for 72 hours, was effective in reducing streptococci, coliform organisms, and bacteroides[6]. Staphylococci were finally reduced but colony counts showed wide variations during therapy. The response of the clostridia was somewhat erratic and following therapy clostridia grew out in greater profusion than in the control specimen. The outgrowth of yeasts during therapy was one indication of effective reduction of the bacterial population. There were few side reactions. Neomycin is the most satisfactory *single* agent yet studied for preoperative preparation of the colon.

Sterosan-Neomycin was administered for 72 hours, Sterosan 200 mg. every six hours and Neomycin 0.5 gm. every hour for four hours then 0.5 gm. every four hours[9]. This combination gave satisfactory control of coliform organisms, clostridia, and bacteroides and partial control of streptococci and staphylococci. Yeasts began to appear during therapy indicating satisfactory bacterial control but inadequate antifungal activity.

Enterobiotic was administered for 72 hours, oxytetracycline 200 mg., neomycin 1 gm. every four hours[10]. There was satisfactory reduction of the coliform organisms and bacteroides as well as ultimate control of streptococci. Staphylococci and clostridia showed widely varying counts in those patients in whom they appeared. There was early proliferation of yeasts, indicating satisfactory bacterial control. There were no disturbing side reactions.

Preferred:—Neomycin-Nystatin was given for 72 hours, neomycin 1 gm. and Nystatin 250,000 units given together every hour for four hours then every four hours for 72 hours[8]. There was rapid and satisfactory control of streptococci, coliform organisms, clostridia, and bacteroides. Yeasts did not appear during therapy in spite of satisfactory control of the bacterial flora, indicating adequate

antifungal activity of Nystatin. The satisfactory reduction of the bacterial flora combined with the satisfactory control of yeasts make this the ideal drug for any patient who has been on prolonged antibacterial therapy or for any patient who might be expected to develop an overgrowth of yeasts during therapy.

Sulfathalidine-Neomycin was administered for 72 hours, Sulfathalidine 1.5 gm., neomycin 1 gm. every hour for four hours then every four hours[10]. There was adequate control of streptococci, coliform organisms, clostridia, and bacteroides plus an absence of staphylococci in those patients being studied. The absence of gastrointestinal side reactions and the lack of absorption of either agent combine to make this one of the best agents for preoperative preparation of the colon.

Achromycin-Neomycin was administered for 72 hours, Achromycin 200 mg., Neomycin 1 gm. every hour for four hours then every six hours[7]. There was rapid and adequate control of streptococci, coliform organisms, clostridia, and bacteroides plus control of staphylococci in half the patients studied. The rapid rise in yeasts during the period of therapy indicated the adequate bacterial control during this time. The relatively rapid return to a normal flora following therapy suggested that the normal relations between the various organisms in the gastrointestinal tract were not too seriously interfered with by the short period of therapy. This combination provided the best bacterial control in our hands and has been selected as the routine method of preoperative preparation for our hospital service.

Clinical Applications

On the basis of this experimental work a routine was established in July 1955 for patients undergoing colon surgery on the Louisiana State University Surgical Service at Charity Hospital. The routine is as follows. Preoperative preparation takes three days. Patients are placed on a low residue diet, given a cathartic the first day, daily enemas, and antibiotics as follows: Achromycin—200 mg., Neomycin 1 gm. every hour for four hours, then every six hours for 72 hours. At operation 5 gm. of sterile Achromycin-Neomycin surgical powder containing Achromycin—250 mg. and Neomycin 1.25 gm. are inserted into the bowel to provide an immediate intraluminal antibiotic level. A plastic tube is inserted in the colon through a #14 gauge needle proximal to the opening and the plastic tube is exteriorized through a stab wound to permit postoperative intraluminal antibiotic administration. For five days postoperatively, the patients receive through this tube Achromycin 150 mg. and Neomycin 750 mg. three times a day.

Between 1 July 1955 and 30 June 1956, 66 patients have been prepared for a variety of colon procedures with the Achromycin-Neomycin routine (Table II). There were no side-effects in 51 patients. The remaining 15 patients complained of nausea 13 times, vomiting 6 times, diarrhea and cramps once each.

In no case were these symptoms severe enough to warrant discontinuance of the drug.

In 23 patients 5 gm. of sterile Achromycin-Neomycin surgical powder were inserted in the lumen of the bowel at operation.

The plastic tube was inserted in the colon in 29 patients and the antibiotic mixture injected for the five-day postoperative period (Table III). Complications which *may* have been related to the use of antibiotics in this fashion were as follows: large bowel distention in one patient; partial obstruction at the anastomosis in two; distention, ileus, and moniliasis following a Swenson pull-through in an 18-month old with Hirschprung's; and severe diarrhea (see below) in one. The role of intraluminal antibiotics in producing any of these symptoms is debatable.

There were two postoperative deaths in the series using the plastic tube, only one of which could be correlated even partially with the use of antibiotics. The patient was an 81-year old male who had extensive colon surgery for an adenocarcinoma of the cecum which had invaded an adherent loop of sigmoid. The patient went into shock on the second postoperative day and the diagnosis of a lower nephron syndrome was made on the fourth postoperative day. Diarrhea, which began on the fifth day, may have contributed to the difficulty in maintaining the patient. This one complicated picture did not seem sufficient to warrant discontinuing the proposed plan of antibiotic therapy.

After a year's trial with this form of therapy most observers have the clinical impression that these patients have a smoother postoperative course and a more rapid return of normal gastrointestinal function. The series, however, is still too small for a valid statistical conclusion.

This clinical study has demonstrated that the technic is practical and is essentially without danger. It is thought that the experimental work coupled with the clinical findings gives added safety to certain colonic operations, particularly those where the colon cannot be adequately cleansed prior to surgery. It is thought that antibiotics introduced through the tube may obviate the need for a proximal decompressive colostomy or cecostomy in many cases where such decompression might otherwise be advocated. Intraluminal antibiotics such as proposed here should contribute to the safety of any emergency colon surgery.

It should be emphasized here, as it has been in all previous work reported from this laboratory, that the antibiotic protection technic is not advocated as a substitute for good surgery nor is it advocated as a means of hiding technical errors. It is advocated as one means of improving the already low mortality and morbidity which prevail when proper surgical principles are followed.

Summary

1. An experimental technic has been described for evaluating the role of antibiotics in colon surgery.

2. Antibiotics have been shown to play a role in protecting a colon anastomosis.

3. Preoperative mechanical cleansing, preoperative antibiotic therapy, and postoperative intraluminal antibiotics each are of value in elective colon surgery.

4. Aureomycin, Terramycin, Achromycin, Mysteclin, Chloromycetin, Cathomycin, Sterosan, Sulfathalidine, and Sulfasuxidine are not recommended for the preoperative preparation of the colon.

5. Neomycin, Sterosan-Neomycin, and Enterobiotic give satisfactory reduction of the bacterial flora of the colon for preoperative preparation.

6. Nystatin-Neomycin, Sulfathalidine-Neomycin, and Achromycin-Neomycin give the best results for preoperative preparation of the colon.

7. Limited clinical experience with the preoperative preparation of choice and with operative and postoperative intraluminal antibiotics has been satisfactory.

8. The proper use of antibiotics should improve the results in colon surgery.

REFERENCES

1. Blain, A., III. and Kennedy, J. D.: The effect of penicillin in experimental intestinal obstruction. Studies on strangulated low ileal obstruction. Bull. Johns Hopkins Hosp., **79**:1, 1946.
2. Cohn, I., Jr.: Strangulation obstruction: Antibiotic protection. Surgery, **39**:630, 1956.
3. Cohn, I., Jr.: Strangulation obstruction—Postoperative antibiotic protection. Ann. Surg., **143**:386, 1956.
4. Cohn, I., Jr.: Strangulation obstruction. The role of bacteria. Springfield, Ill., Charles C. Thomas, In Publication.
5. Cohn, I., Jr., Langford, D. and Rives, J. D.: Antibiotic support of colon anastomoses. Surg., Gynec. & Obst., **104**:1, 1957.
6. Cohn, I., Jr. and Longacre, A. B.: Preoperative sterilization of the colon. Comparison of various antibacterial agents. In *Antibiotics Annual 1955-1956*, New York, N. Y., Medical Encyclopedia, Inc., 1956. pp. 105-117.
7. Cohn, I., Jr. and Longacre, A. B.: Tetracycline (Achromycin)-Neomycin for preoperative colon preparation. Arch. Surg., **72**:371, 1956.
8. Cohn, I., Jr. and Longacre, A. B.: Neomycin-nystatin for preoperative preparation of the colon. Ann. Surg., **22**:301, 1956.
9. Cohn, I., Jr. and Longacre, A. B.: Chlorquinaldol (Sterosan) and Chlorquinaldol-Neomycin for preoperative preparation of the colon. Gastroenterology, **32**:855, 1957.
10. Cohn, I., Jr. and Longacre, A. B.: Preoperative sterilization of the colon. Comparison of various antibacterial agents. II. In *Antibiotics Annual 1956-1957*, New York, N. Y., Medical Encyclopedia, Inc., 1957. pp. 253-264.
11. Cohn, I., Jr. and Rives, J. D.: Antibiotic protection of colon anastomoses. Ann. Surg., **141**:707, 1955.
12. Cohn, I., Jr. and Rives, J. D.: Protection of colon anastomoses with antibiotics. Ann. Surg. **147**:738, 1956.
13. Firor, W. M. and Jonas, A. F.: The use of sulfanilylguanidine in surgical patients. Ann. Surg., **114**:19, 1941.
14. Garlock, J. H. and Seley, G. P.: The use of sulfanilamide in surgery of the colon and rectum. Preliminary report. Surgery, **5**:787, 1939.
15. Jones, T. E., Robinson, J. R. and Meads, G. B.: One hundred and thirty-seven consecutive combined abdominoperineal resections without mortality. Arch. Surg., **56**:109, 1948.

16. Marshall, E. K., Jr., Bratton, A. C., White, H. J. and Litchfield, J. T., Jr.: Sulfanilylguanidine: A chemotherapeutic agent for intestinal infections. Bull. Johns Hopkins Hosp., **67**:163, 1940.
17. Poth, E. J., Martin, R. G., Fromm, S. M., Wise, R. I. and Hsiang, C. M.: A critical analysis of neomycin as an intestinal antiseptic. Texas Rep. Biol. & Med., **9**:631, 1951.
18. Poth, E. J. and McClure, J. N., Jr.: Intestinal obstruction. The protective action of sulfasuxidine and sulfathalidine to the ileum following vascular damage. Ann. Surg., **131**:159, 1950.
19. Poth, E. J., McNeill, J. P., Manhoff, L. J., King, W. B. and Sinclair, J. G.: The healing of bowel as influenced by sulfasuxidine and streptomycin. Surg., Gynec. & Obst., **86**:641, 1948.
20. Rabinovici, N. and Fine, J.: The effect of aureomycin on the intestine subjected to vascular injury. Ann. Surg., **135**:344, 1952.

Discussion

Dr. O. H. Wangensteen:—With reference to Dr. Cohn's paper, I think he has proved beyond any possibility of doubt that in a dog, if you devascularize a short segment, that the segment has a far better chance of survival. I am not persuaded, however, that the use of intestinal antibiotics will lower the mortality in colic surgery. In 1943 (*Surgery* **14**:403-432, 1943) in the very same paper I alluded to previously in this discussion, I reported the experience with colic resection at our University Hospitals for the preceding two years. We had then the lowest mortality we have ever had with colectomy. In the two-year interval between 1941 and 1943 we had 61 consecutive colic resections, with one death. Our current mortality runs in the area of 4 to 5 per cent for primary near or total colectomy.

My feeling about colic resection is simply this: One should strive to make a nice closed resection without spillage. Before the anterior sutures are tied, following placement and tieing of the posterior row, I pull the untied anterior sutures aside toward either end of the anastomosis and place a few interrupted sutures in the mucosa of the posterior row. The surgeon then changes his gloves and completes the anterior portion of the anastomosis. The needle holders and needles used in the placement of these few sutures also are discarded. If spillage occurs during an anastomosis, all the drugs in New York City are not as good as though the anastomosis had been made without spillage. The patient may get well with spillage, but there is no substitute that can equal well executed precise surgery in keeping morbidity and mortality low in intestinal surgery. And in the presence of acute intestinal obstruction, if spillage occurs, despite antibiotics, not only will the morbidity be greater but the mortality too. Nothing is as good as overcoming the obstruction without spillage of intestinal content.

Nor am I persuaded that antibiotics have been an important factor in the reduction of mortality in acute intestinal obstruction. The items which still contribute importantly to mortality in intestinal obstrucion are: 1. great intestinal distention, 2. intestinal strangulation and gangrene of the bowel, 3. obstructions, technically difficult to deal with such as, congenital intestinal atresia, meconium ileus, etc.

Dr. I. Snapper:—When I hear my surgical colleagues it appears as if a colon resection is a very effective and hardly dangerous method to cure carcinoma of the colon. In contrast, Dr. Gilchrist a few years ago has reported to us that a simple colon resection is a very unsatisfactory operation and that much more complicated operations are necessary to assure a favorable result in carcinoma of the colon. Now we have to reconsider this problem from a new angle, because Dr. Cohn's investigation indicates that before the operation careful bacteriologic investigation is necessary to diminish the dangers of resection of the colon.

I think I understood correctly that aureomycin and terramycin do not eradicate the clostridia of the intestine. Both these drugs have been used rather extensively for the treatment of amebic dysentery. Neither of these drugs have a significant amebicidic action and the apparently favorable results were explained by the bacteridic action of these drugs upon the clostridia on which the amebae feed. In other words the amebic infestation was cured by these drugs because the food of the amebae was destroyed. I hope that Dr. Cohn enlightens us about these contradictory statements.

Dr. Irving A. Levin:—Dr. Cohn, I have one question for you: How do you feel about the routine intramuscular postoperative use of antibiotics, with reference particularly to streptomycins?

Dr. Cohn:—Is this in postoperative therapy?

Dr. Levin:—I assume it is.

Dr. Cohn:—Let me answer that question first. Our feeling is that parenteral antibiotics alone will not provide the desired concentration of antibiotics within the lumen of the colon. While we certainly would use them in the average colon case for their systemic effect, we have shown in other work, as has also been shown in Dr. Fine's laboratory in Boston, that it is not possible to obtain adequate amounts of antibiotic in either the small or large bowel by parenteral antibiotic therapy alone.

Dr. Wangensteen's questions about whether or not one needs antibiotics in preparing patients for colon surgery are the same questions that got me interested in this particular field.

I was trained in Philadelphia, and my chief there used to say that he was happy to have antibiotics, but he had done colon surgery without too much trouble before the days of antibiotics and he didn't really think they were necessary. The residents used to discuss this and usually disagreed thoroughly.

When I came to New Orleans, Dr. Rives said almost the same thing. When I voiced my opinion, his answer was, "See if you can find a way to determine experimentally which of us is correct", and our work on the dog was an attempt to answer this problem.

Someone has said that something similar has been presented in the past, and that, since the average American surgeon does not collect many fees from the operations he does on dogs, this work should not be transferred completely to the patient material with which the surgeon works. It is true that one does not get many fees from dog operations, and of course one does not purposely devascularize the bowel in a patient. That would be foolish, and no one would leave behind any bowel which he knew had been deprived of its vascular supply. Troubles arise when one inadvertently devascularizes an anastomosis, or makes an anastomosis under so much tension that there is impaired viability of the anastomotic segment.

Having been brought up in the antibiotic era in medicine, I am still rather attached to them and cannot force myself to leave them, though I would certainly not deny the fact that in the hands of such a master surgeon as Dr. Wangensteen, or the people who trained me, the results are likely to be better without antibiotics than my results with antibiotics.

The problem of a fatal antibiotic colitis or enteritis has been reported and is a very major complication that is to be dreaded. Fortunately, we have not had this complication on our service at Charity Hospital. I have heard reliable reports of three cases of fatal colitis and enteritis which occurred in New Orleans within the past few years. I believe all were nonsurgical cases. One was a patient being treated for pneumonia. One was a case of sepsis, and the details on the third case were never given to me, but the enteritis diagnosis was confirmed.

While we know this complication does exist, we feel that it is so infrequent that it is not of sufficient importance to contraindicate the use of antibiotics.

I am unable to completely answer Dr. Snapper's question regarding the effect of Aureomycin and Terramycin on clostridia. In our hands we were not able to control clostridia with either of these drugs. I do not know enough about amebiasis to get into this argument, except to say that at Louisiana State University Dr. Frye, who has been interested in amebiasis for quite some time, became interested in other work we were doing because he thought the sterile loop of bowel we created would be an ideal place in which to study amebiasis. It happens that the bowel was not entirely sterile and he could not use it, but he must have had in mind some other pabulum for the amebae to grow on besides the clostridia.

Dr. Snapper is concerned about the possibility of our extensive use of antibiotics being dictated by the excessive dangers of colon surgery. We really believe that colon surgery is safe today, and we do not hesitate to do any type of colon surgery that is necessary. We would, however, like to add anything that might make it a little safer for the future.

Clinicopathological Conference*

from the Touro Infirmary, New Orleans, La.

PROTOCOL

Dr. Ambrose J. Hertzog‡:—Case No. S-56-6203, a 52-year old housewife, was admitted to Touro Infirmary on 13 November 1956 complaining of jaundice. She was a native of Louisiana who gave a long history of gastrointestinal complaints. An appendectomy was performed elsewhere in 1954. In 1955 she was treated elsewhere for amebiasis although no parasites were demonstrated in the stool. A gallbladder x-ray study elsewhere in 1955 revealed a normal gallbladder with no stones. During June and July of 1956 she received typhoid and smallpox immunization.

Her present illness began about 5 weeks prior to admission with anorexia, nausea, and malaise. This subsided after two weeks but about 1 November she noticed the onset of painless jaundice without fever for which she was admitted to another hospital on 3 November 1956. She had noticed that her stools varied from light green to light yellow in color while her urine was darkly colored. Physical examination was negative except for the jaundice. The liver was palpable one finger below the costal margin and nontender. A gallbladder x-ray study revealed a poorly functioning gallbladder and the gastrointestinal x-ray examination was negative. The duodenal loop was of normal size and did not suggest any associated pathology.

Laboratory examination during this hospital admission revealed hemoglobin 13 gm., red blood cells 4,710,000, and white blood cells 5,400. Urine was positive for bile and negative for urobilinogen. Serology was negative, amylase 64 units, stool trypsin was positive to 120, blood glucose 81 mg. per cent and blood cholesterol 260 mg. per cent. Two prothrombin levels were 19 per cent and 80 per cent of normal; the 19 per cent reading was considered inaccurate. Stools were negative for occult blood after three days on a meat free diet. Bilirubin varied from 10.3 to 12.5 mg. per cent with direct readings between 5.5 and 8. mg. per cent. Alkaline phosphatase was 1.5 units on 3 November 1956, 6.5 units on 7 November 1956, and 6.3 units on 12 November 1956. Serum proteins were 5.6 with a ratio of 1.5 albumin to 1.0 globulin. Thymol turbidity was 2 units and cephalin flocculation test was negative on two occasions. She was discharged for transfer to Touro Infirmary on 12 November 1956.

Physical examination on admission showed blood pressure 120 mm. systolic and 82 mm. diastolic, pulse 76, respiration 18, and temperature 98.8 degrees F. She was in no acute distress but markedly jaundiced. The skin of the chest

*Ed. Note: This is the first in a series of Clinicopathological Conferences which are to appear regularly. They are being obtained by Dr. John M. McMahon of Bessemer, Ala., and are edited by Dr. Michael W. Shutkin of Milwaukee, Wisc.

‡Pathologist, Touro Infirmary.

wall revealed capillary dilatations. Liver, spleen or abdominal masses were not palpated. Prothrombin time was 14.4 seconds with a control of 14 after receiving 100 mg. of Mephyton on 12 November. Urinalysis showed specific gravity of 1.011 with a trace of albumin and bile positive. Hematocrit was 37; hemoglobin 11.5 mg.; white blood cells 6,600 with 61 per cent neutrophiles. Serum bilirubin was 10.7 mg. with 4.8 mg. indirect reading. Blood glucose 90 mg. per cent and NPN 35 mg. per cent, alkaline phosphatase 10.4 Bodansky units, serum proteins were 6.0 gm. with 3.4 gm. of albumin and 2.6 gm. of globulin. A specimen of urine showed 2.6 Ehrlich units of urobilinogen. Cephalin flocculation test was negative. Serum bilirubin on 27 November 1956 had risen to 13.1 mg. An intravenous cholangiogram on 16 November 1956 showed very questionable visualization of the common bile duct. Kolmer and VDRL were negative. The patient's jaundice persisted and she was usually afebrile except for a 99 degree F. fever on three occasions. A needle liver biopsy on 17 November 1956 was followed with surgical exploration on 21 November 1956.

Differential Diagnosis

*Dr. Samuel Nadler**:—Examination of the protocol will indicate that we are dealing with jaundice in a 52-year old female, a native of Louisiana, with a long standing history of gastrointestinal complaints, interrupted in 1954 by an appendectomy and later in 1955 by gallbladder visualization which failed to show evidence of pathology on x-ray. In the summer of 1956 she had smallpox and typhoid immunization and about three months later had a two week period of anorexia, malaise and nausea followed a week later by the appearance of jaundice. One outstanding feature of this history was the fact that this jaundice was deep; it occurred in an afebrile patient, and it was painless. It would appear that during the period of observation, certainly at Touro Infirmary, that there was little or no bile entering the gastrointestinal tract. Before admittance you will note there was a negative urine urobilinogen. We do know that the urobilinogen can be negative if the urine is old, and exposure to sunlight will change urobilinogen to urobilin which then will not react with urobilinogen reagents. In the second urobilinogen estimation there was some urobilinogen in the urine. This is compatible with complete absence of flow through the bile ducts because in the deeply jaundiced patient some bile pigment can enter through collateral channels, as in the gastrointestinal secretions. We have no reason to doubt the other figure and must assume that this patient had a negative urine urobilinogen. This would mean of course the complete absence of bile pigment from the gastrointestinal tract. In addition, the serum bilirubin levels were rather high, rising to 13 mg. per cent. One of the groups considered in the differential diagnosis of jaundice is the hemolytic anemias, and almost as a subgroup, though not truly hemolytic anemia, one may think of congenital

*Associate Professor of Medicine, Tulane University School of Medicine.

hepatic dysfunctions, one described by Gilbert and the other of the Dubin-Johnson type. Hemolytic anemia should be considered in every case of jaundice because cases of hemolytic anemia may be complicated by pigment stone formation and obstructive phenomena and even by hepatitis. In this case we do not find any of the stigmata of hemolytic anemia. These stigmata include a greater or lesser degree of anemia and even that may be absent in hemolytic anemia, as you know, if the rate of blood destruction is paralleled by the rate of formation, the patient may maintain fairly normal blood counts. In most cases of hemolytic anemia, either congenital or acquired, there is a certain degree of anemia. In addition, these cases almost uniformly show increased urobilinogen in the urine and that is absent here. Furthermore, they show moderate rather than very high levels of serum bilirubin which is the case here, and the bilirubin circulating in the blood is usually of the indirect-reacting type. In addition, most of the hemolytic anemias, certainly of the acquired and congenital type, can have increased red cell fragility, spherocytosis and practically all of them have some degree of regenerative phenomena in the peripheral blood which is not noted in this protocol. Uncomplicated hemolytic anemias show primarily an acholuric type of jaundice, i.e., jaundice without the appearance of bile pigment in the urine. This patient had bile pigment in her urine. The congenital types of hepatic dysfunction of the Gilbert and Dubin-Johnson types seldom have serum bilirubins over 5 mg. per cent. The Gilbert type is associated with hemobilirubin or indirect-reacting bilirubin in the serum and no bile pigment in the urine whereas the Dubin-Johnson type is associated with bilirubin in the urine. I think it is fair to conclude that both hemolytic anemia groups and congenital hepatic dysfunction groups can be ruled out so far as this differential diagnosis is concerned.

A second large group of liver involvement associated with jaundice are those involving degeneration of the liver cell. Actually one can classify three broad groups associated with severe jaundice which are sometimes painful and include the hepatitides. These will include the viral hepatitides and the viral type associated with infectious disease, e.g., infectious mononucleosis. This type of hepatitis is, in my own experience and if I may be allowed to have one selected prejudice, almost invariably associated with a positive cephalin flocculation test after jaundice has set in, especially during the first two or three weeks of jaundice. I would not entertain a diagnosis of hepatitis severe enough to produce complete obstruction of bile flow into the gastrointestinal tract, without wanting to see a positive flocculation test at some time. It is true that hepatitis before the onset of jaundice may be associated with negative flocculation tests in as high as 50 per cent of the cases reported in a very large series in the Army, but these were all positive after jaundice appeared.

Another group, granulomas, are merely mentioned because they are almost invariably associated with fever and to a lesser degree a positive cephalin flocculation test. Obstruction to bile flow is practically never complete and I would

say here that one should not give serious consideration to granuloma in the face of the data against it. Amebiasis of the liver can occur in a diffuse form, as a diffuse hepatitis, or as a localized process in the form of an abscess which has other associated signs such as sepsis, leucocytosis, fever and a clinical course which is different from this. Seldom is either form of amebic involvement of the liver associated with complete obstruction of the flow of bile pigment into the gastrointestinal tract.

Cirrhosis of the liver reaching the stage where there is a complete block to the bile flow into the gastrointestinal tract means very severe involvement of the liver sometimes associated with late or terminal stages of cirrhosis of the liver. Certainly, this patient did not demonstrate stigmata of liver decompensation such as spider angiomata, peripheral signs of anastomotic involvement of portal or systemic circulation, absence of liver enlargement, no actual diminution of liver size and the absence of decompensation as manifested by ascites. I would venture to say that if a patient had cirrhosis associated with enough liver involvement to cause complete obstruction to the flow of bile pigment into the gut, that patient would necessarily have an exacerbation of parenchymatous cell involvement which would reveal all the characteristics of an acute infectious hepatitis from the standpoint of laboratory fiindings. From the above considerations one may assume that liver cell degenerative phenomena hardly played a role in this patient, although this could be very definitely determined by liver biopsy, which was performed on this patient.

The last large group, namely, obstructive jaundice, both extrahepatic and intrahepatic, is an interesting consideration because of the many interesting phenomena that lead to this impression. These are increased serum bilirubin, direct reacting bilirubin in the blood, bilirubin in the urine, absence or a trace of urine urobilinogen, negative flocculation tests, rising values of alkaline phosphatase, high serum cholesterol, certainly at the upper limit of any normal, and low to low normal serum protein. All these findings on this patient are a rather impressive array and would seem to point to the phenomena seen with complete obstruction to the flow of bile into the gastrointestinal tract.

There are three or four main causes for extrahepatic block. A complete block over a long period of time is caused in most instances by tumor, i.e., a tumor involving the ductal system itself such as primary carcinoma of the bile ducts, or carcinoma of the ampulla of Vater and primary carcinoma of the head of the pancreas. In these instances, the jaundice is unremitting. It persists as a complete block until the death of the patient or the obstruction is relieved. Actually, there are cases on record in which nothing has been done to the patient and yet there has been a remission of the jaundice associated with slough of the malignant tissue permitting relief of the obstruction at least for a time. Metastatic carcinoma, particularly to the nodes at the hilum of the liver, does not cause jaundice very early and usually these patients have signs of

malignancy such as low grade fever, prolonged anorexia and an insidious type of normocytic normochromic anemia. Metastatic carcinoma can produce obstruction but this occurs actually, by fixation of the duct. The reason that one seldom sees complete obstruction associated with inflammation of the nodes at the hilum of the liver is that the duct can be pushed aside by these nodes. For this reason Hodgkin's disease of the hilar nodes produces extrahepatic obstruction rather rarely compared to the number of times that hilar nodes of the liver are involved; similar considerations apply to leukemia and inflammatory involvement of these nodes. Of the tumors selected, if one were chosen, we would favor a tumor of the head of the pancreas, or primary involvement of the biliary ductal system and the common duct. As you know, involvement of the right hepatic or left hepatic duct alone will not produce jaundice.

A second cause of extrahepatic obstruction is stone. There is a common feeling that if the stone is impacted in the ampulla of Vater or in the common bile duct the obstruction is complete, and remains complete until the stone is passed or removed. This is a fallacy commonly accepted without question. Following stone impaction, spasm and edema subside after a variable period of time changing a complete to an incomplete obstruction of the common duct. It is not nearly as constant in the production of long standing, complete obstruction as malignant involvement of the ductal system is. In this case the patient had been observed for only 3 weeks; one need therefore give serious consideration to stone in the common duct as a cause of extrahepatic obstruction. Strictures, I think, can be ruled out without much difficulty since they usually follow gallbladder surgery or surgery on the biliary tract. Rare causes such as duodenitis associated with diverticulum of the duodenum is ruled out by the normal gastrointestinal series. There is no reason to postulate obstruction by parasites at this time. Of the causes of extrahepatic obstruction, then, one should give serious consideration to carcinoma at the head of the pancreas, primary carcinoma of the ductal system and obstruction by stone.

In addition to extrahepatic obstruction, there can be obstruction occurring within the liver itself occasioned by cholangiolitis, popularized chiefly by Cecil Watson. The process involves the terminal ends of the fine bile canaliculi. The idiopathic type fails to demonstrate organic change on pathological sections associated with jaundice. It can be complete over a very long period of time and with findings that exactly simulate those of extrahepatic obstruction. In addition, it has been noted to follow such drugs as thorazine, testosterone and others, as well as during the healing stages of a previous viral hepatitis. In the absence of known drug therapy and viral hepatitis one might assume that this is possibly of the essential type, unless it may in some remote fashion be associated with the innoculations this patient received about three months before. Certainly we know that such innoculations carry the problem of possible hepatitis of the type known as homologous serum jaundice. I do not believe it pres-

ent in this patient because of the negative flocculation tests. Essential cholangiolitis of the type described by Cecil Watson deserves serious consideration.

We note in the protocol that a liver biopsy was done on this patient. What can the liver biopsy reveal? I don't think it will help very much if the reasoning followed here is correct. It certainly will not show anything with reference to group A which is out of the picture. Group B dealing with liver cell degenerations can clinically be eliminated. What value would it have in differentiating between extrahepatic and intrahepatic obstruction? Actually, a liver biopsy in the first three weeks of jaundice would show identical findings with these two forms of obstructive jaundice. Those findings usually consist of bile pigment staining of the cells about the central vein, round cell infiltration of the portal triad, and in addition, bile canaliculi with bile casts or inspissated bile thrombi in the finer channels. Now it is true that in long standing extrahepatic obstruction further changes may be found on liver biopsy which are absent in cholangiolitis. These changes with extrahepatic obstruction are of two types. One, the extravasation of bile pigment in the liver parenchyma and two, actual infarction of the liver tissue associated with compression of the finer branches of the hepatic artery.

I don't know much about the pathological findings from personal experience. I would venture to say we could stop at the stage of inspissation of the bile canaliculi and that no differential diagnosis can be established on the basis of the liver biopsy. I think the surgeon, under these circumstances at least, was perfectly justified in exploration to determine whether the two common causes of complete obstruction were absent, namely, carcinoma involving any part of the ductal system or stone in the common duct. My choice in this instance cannot be influenced by the data we have at hand. I think it is a rank guess at this time whether cholangiolitis causing intrahepatic obstruction or an extrahepatic obstruction is present. This should be differentiated by operative intervention.

Discussion

Dr. Hertzog:—Thank you, Dr. Nadler. I will show the liver biopsy in a moment. In the meantime, are there any questions or comments anyone would like to make?

Dr. Cabiran:—May I ask you about the specimen of urine urobilinogen. Did the 2.6 Ehrlich units represent a two-hour specimen or a 24-hour specimen?

Dr. Hertzog:—We use the Watson method with collection of urine during a stated two hour interval in the afternoon when the excretion of urobilinogen is believed to be greater than in the mornings. Values by this method of greater than 1.5 Ehrlich units are usually associated with abnormal liver function.

Dr. Irving Rosen:—May I ask Dr. Nadler a question about the alkaline phosphatase level reported. I have seen several cases in the literature of extra-

hepatic biliary obstruction where the alkaline phosphatase level was elevated in proportion to the serum bilirubin level. Of course, in cases of intrahepatic obstruction or the cholangiolitic type of hepatitis, the alkaline phosphatase level is often normal or slightly elevated, and not at all in proportion to the level of jaundice exhibited by the serum bilirubin.

Dr. Nadler:—My impression is just the reverse. In cholangiolitis, there is a very early rise in alkaline phosphatase before the serum bilirubin is elevated. The alkaline phosphatase in this case was low for both intrahepatic and extrahepatic obstruction because, as you know, the alkaline phosphatase only rose to 10.4 Bodansky units. This cannot be regarded as a critical level in differentiating between an intrahepatic and an extrahepatic obstruction type of jaundice. I do not believe there is an actual parallelism between alkaline phosphatase and serum bilirubin levels. Actually, in cholangiolitis, the alkaline phosphatase rises first.

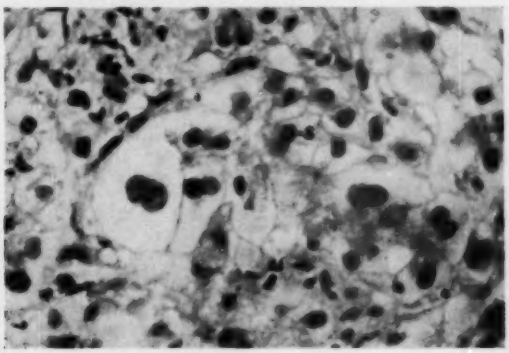


Fig. 1—Photomicrograph of needle biopsy of liver showing swollen parenchymal cells (balloon cells) indicative of a virus hepatitis.

Dr. Louis Ochs:—I am sorry that our two liver biopsy experts, namely, Dr. Christian and Dr. Davis, are not here. I do not think that they would agree with Dr. Nadler's statement that a liver biopsy would furnish little information at this stage. I think they, as well as many others who champion liver biopsy, feel that it will show much more. Many of us who have had the experience of putting a patient to sleep with jaundice and have them go into hepatic coma and never wake up much prefer to do a liver biopsy under local anesthesia. I think a liver biopsy is indicated in patients who have obscure medical conditions even in the absence of jaundice. I think in a case like this we should not depend too much on liver brackets but place more emphasis on the physical findings and history. What interests me in this patient is that she had a liver that was enlarged and upon arrival at Touro Infirmary it was no longer palpable. That to me would suggest intrahepatic biliary obstruction. No mention is made whether she did or did not have pruritus. When the statement about

dilated capillaries on the chest wall was made, I don't know why they omitted to mention spider angiomata.

Dr. Hertzog:—I would guess that the examiner was looking for spider angiomata but did not see them and made the notation about the capillaries to let one know he was looking for spider angiomata.

Dr. Ochs:—I would like to bring out one other point, namely, that today there are other drugs besides Thorazine and arsenic that will produce lesions in the liver. A liver biopsy may spare the patient a diagnosis of a hopeless disease. I think that liver biopsy in this case probably made the diagnosis. As done in so many cases, operation is performed to give a patient every chance for recovery. I feel that liver biopsies should be done more often and repeated as often as necessary. The results of therapy can be evaluated. Liver biopsies can save many of these cases from surgical exploration. These patients, after a general anesthetic and when given demerol postoperatively, may go into hepatic failure and die. We never realize this possibility until it hits home. A needle biopsy of the liver is not a major surgical procedure and can be done right in the patient's room.

Dr. Hertzog:—I am glad Dr. Ochs brought this up because it gives me an opporunity to both agree and disagree with him about liver biopsies. We had two liver biopsies in this case, a needle biopsy prior to surgery and a scalpel biopsy at the time of surgery. This (slide) is a photomicrograph of the scalpel biopsy. They are more or less interchangeable from a histological standpoint. But the scalpel biopsy shows better the architectural pattern of the lobules. This is one thing that we have difficulty with at times with needle biopsies in obtaining enough tissue for study of the architectural pattern and evaluating the amount of portal infiltrate and portal fibrosis present. The striking thing in this specimen is the marked number of bile thrombi present, particularly around the centers of the lobules, as well as a lot of bile stasis. With this magnification the hepatic cells look fairly normal. I do not think that with this low magnification we can say there is any appreciable hepatocellular damage. The next slide is a photomicrograph under higher magnification of the preoperative needle biopsy showing a few large pale swollen vaculated cells (Fig. 1). These are the so-called balloon cells that are indicative of hepatocellular damage and according to Gall and Braunstein are not found in extrahepatic biliary obstruction. One can see the portal spaces in this needle biopsy on this next slide. There is present a mild mononuclear inflammatory exudate. A portal inflammatory exudate is more common in cholangiolitic hepatitis than in extrahepatic biliary obstruction.

I want to show you a chart from a recent article by Gall and Braunstein[1] that illustrates the difficulties that pathologists have in interpreting liver biopsies where there is the problem of differentiating between intrahepatic and

extrahepatic biliary obstruction (slide). They divide conditions in which liver biopsies are commonly done in jaundice into three groups. Group one is typical viral hepatitis. Group two is hepatitis simulating biliary obstruction. Group three is extrahepatic biliary obstruction. Now our problem in this case I think is not so much with typical viral hepatitis. Dr. Nadler has shown that this is pretty well eliminated by the laboratory findings. We must make a distinction between cholangiolitic hepatitis simulating extrahepatic biliary obstruction and true extrahepatic biliary obstruction due to stone or tumor involving the bile ducts or pancreas. Gall and Braunstein list a very extensive group of helpful cytological and histological criteria. In summary, our best criteria is really the absence of balloon cells or multinucleated parenchymal cells in extrahepatic biliary obstruction. Gall and Braunstein stress that in the so-called cholangiolitic hepatitis we should have some histological evidence of hepatocellular damage.

We told the surgeon prior to operation that we would interpret the needle biopsy as showing evidence of hepatocellular damage consistent with cholangiolitic hepatitis but that we did not feel justified in making an unequivocal diagnosis. A pathologist has occasionally to leave the back door open. Dr. Craighead explored this case. Dr. Nadler and I both think he was justified because as Dr. Nadler pointed out, if these patients do have extrahepatic biliary obstruction and it is allowed to persist, irreparable harm can be done to the liver. Furthermore, another pathologist who saw the needle biopsy in consultation considered it diagnostic of extrahepatic biliary obstruction. I will ask Dr. Craighead to tell us what he found at operation.

Dr. Claude Craighead:—At the time of operation, the liver was moderately enlarged, slightly irregular, extremely firm and on cut section was quite gritty. The extrahepatic biliary system was completely normal. We isolated the common duct and performed an operative cholangiogram to be certain that there was no extrahepatic biliary obstruction. Dr. Payzant will demonstrate the x-rays.

Dr. Arthur Payzant:—You can all see that the gallbladder is normal in size and the common bile duct is not dilated. There are no stones; the dye goes into the duodenum very readily and there is no obstruction to the common bile duct.

Dr. Hertzog:—I would like to show you another chart from Gall and Braunstein's article in which they contrast 14 cases of cholangiolitic hepatitis with 30 cases of typical virus hepatitis (slide). They point out that cholangiolitic hepatitis occurs in an older age group and it has a markedly more prolonged duration. The tendency towards prolonged jaundice is well illustrated in this case. When she left Touro she improved but later relapsed and returned to a hospital near her home. She still has a markedly elevated bilirubin. The other laboratory findings are practically the same as far as the cephalin flocculation test, bile in the urine, and urobilinogen are concerned. Gall and Braunstein found cephalin flocculation tests to be negative in one third of their cases of cholangiolitic

hepatitis. Cholesterol was elevated in 71 per cent and alkaline phosphatase was elevated in 45 per cent of the cases. This shows that these tests cannot be relied upon to differentiate cholangiolitic hepatitis from extrahepatic biliary obstruction.

Cholangiolitic hepatitis is a relatively rare cause of jaundice in our experience. We have had three cases that I can remember in the last several years; one was surgically explored with negative results. I would like to show you a photomicrograph of a needle biopsy of the third case. This was a middle-aged man with symptoms a great deal similar to this case under discussion today and we were faced with the same problems in interpreting the biopsy. After much consultation and help from Dr. William Davis, a diagnosis of cholangiolitic hepatitis was made on the presence of balloon cells and multinucleated hepatic cells. One medical consultant advised surgery. The patient, however, refused operation and he eventually recovered after a long siege of jaundice.

As mentioned by Dr. Nadler, Cecil Watson[2] has gone a long ways in popularizing this type of hepatitis simulating obstructive jaundice. He was not, however, the first to describe it. It was first described by Eppinger in Vienna in 1937 as primarily a disease of the bile canaliculi between the bile capillaries within the lobules and the small bile ducts in the portal spaces. As I have mentioned, however, Gall has emphasized the presence of a minor degree of hepatocellular damage in these cases.

Dr. Nadler:—I think I learned something from this conference because I did not have any previous idea that the findings on biopsy could be so definitive in a cholangiolitic type of jaundice. I certainly want to clear the air of at least one thing and that is that I did not mean to imply that liver biopsy is not of value and should not be done often. What I said was that I did not believe that liver biopsy in this case would help the surgeon or me to differentiate between the two conditions that required serious consideration, namely, intrahepatic versus extrahepatic block. Certainly, liver biopsy is of inestimable value in many instances in establishing an etiological diagnosis. Still looking at the first slide that Dr. Hertzog showed, I am quite sure that similar changes are seen in obstructive jaundice and have been reported in obstructive jaundice.

If I were the patient I would still want to be explored, knowing that in the absence of definite hepatocellular damage, the danger of surgery is not very great providing there are no extenuating circumstances. I feel that one might very well overlook a benign obstruction such as a stone resulting in irreparable liver damage when this could have been corrected early. I think the chief danger is in operating on cases that do have signs of involvement of the liver parenchyma because these patients tend to slip into a fatal termination. If the liver parenchyma is intact, they have a fair chance of surviving the surgery. Thank you very much.

Conclusion

Dr. Hertzog:—The final diagnosis is cholangiolitic hepatitis simulating extrahepatic biliary obstruction. Liver biopsies in these cases are difficult to interpret and not always conclusive. Minor evidence of hepatocellular damage such as balloon cells and multinucleated hepatic cells is the best histologic criteria by which to separate these cases from extrahepatic biliary obstruction. Whether some of these cases will develop cirrhosis of the liver is debatable as all do not agree with Watson's earlier reports on this subject.

REFERENCES

1. Gall, E. A. and Braunstein, H.: Hepatitis with manifestations simulating bile duct obstruction (so-called cholangiolitic hepatitis). Am. J. Clin. Path., **25**:1113-1127, 1955.
2. Watson, C. J. and Hoffbauer, F. W.: The problem of prolonged hepatitis with particular reference to the cholangiolitic type and to the development of cholangiolitic cirrhosis of the liver. Ann. Int. Med., **25**:195-227, 1946.

Metamucil stimulates normal peristalsis *and* produces soft, easy stools. "Smoothage" management with Metamucil may be continued as long as desired in every type of constipation.

METAMUCIL® SEARLE

psyllium hydrophilic mucilloid with dextrose

SEE OUR EXHIBIT AT BOOTH 13

President's Message

Convention Reward

The October convention in Boston will be one of our best creations. The dividends of attendance will give you the latest things in gastroenterology. This includes the latest concepts of electrolyte management of gastrointestinal disease, new approaches to pancreatic diseases, new ulcer therapy, anesthesia in various gastrointestinal and liver diseases, approaches to small intestine problems, food poisoning, and many other subjects too numerous for this page.

The ladies of our membership are invited and will also be entertained. They will have style shows, interesting lectures and tours of Boston. They will participate in a buffet dinner, the 25th Annual Banquet, teas, etc.

Our convention is a demonstration of cooperative action coming from the united effort of our officers and committees, working as a unit. At a convention we come to learn, to be instructed, and to contribute something worthwhile to our friends and fellow members. The exchange of knowledge and information at the convention opens our eyes and thoughts to many things.

We hope to bring you knowledge and information in such a way as to arouse your spirit and enthusiasm. In this way you will return home with more punch and vigor for your practice as well as for our organization. Set aside October 20th to 24th at Boston as a most important date in our Organization's year.

Be there!!

Arthur A. Kirchner

NEWS NOTES

Twenty-Second Annual Convention

This year the American College of Gastroenterology returns to Boston for its Twenty-second Annual Convention which will open at The Somerset on Sunday, 20 October 1957 with the Annual Meeting of the Board of Trustees. Following the Board meeting, the Governors and Trustees will have lunch and then the Trustees will finish their meeting.

The largest attendance at any of our Conventions was recorded at the Boston meeting in 1949 and it is anticipated that this year's figures will be as high. Registration will commence at 1:00 P.M., on Sunday, and the Annual Meeting of the Fellowship, at which election of Officers, Trustees and Governors and voting on amendments to the Constitution and By-laws will take place, will be held at 3:00 P.M. The Woman's Auxiliary will hold their business meeting at 2:30 P.M. and a Welcome Tea at 4:00 P.M.

The Annual Convocation Ceremony, at which certificates will be presented to Honorary Fellows and to newly elected and advanced Fellows will take place at 6:30 P.M., in the Louis XIV Ballroom. This is always an impressive event, not only for those receiving certificates but also for those participating. The speaker of the evening will be Dr. Chester S. Keefer of Boston, Mass., who will receive an Honorary Fellowship.

This year we are fortunate in having the Buffet Supper sponsored by William H. Rorer, Inc., of Philadelphia, Pa. Admission will be by card only and this may be obtained at the Convocation Ceremony.

The Scientific Sessions which begin Monday morning in the Louis XIV Ballroom will continue through Wednesday evening. Following the success of the panel discussions in New York City last year, four panel discussions are on the program in addition to the individual papers.

A feature of the Convention not to be overlooked is the Technical and Scientific Exhibits which will be open on all three days and will be located in the area adjacent to the registration desk and entrance to the meeting rooms.

Commencing Monday morning at 8:30 and each morning through Wednesday, coffee and doughnuts will be served in the Exhibit Area.

Once again on Monday, 21 October, Burton, Parsons & Co. of Washington, D. C., will sponsor the luncheon for those attending. As usual, a prominent speaker will address the group and tickets will be available at the registration desk.

On Tuesday evening, 22 October, the Twenty-fifth Anniversary Banquet of the College will be held in the Louis XIV Ballroom. Six members of the

Program

AMERICAN COLLEGE OF GASTROENTEROLOGY

TWENTY-SECOND ANNUAL CONVENTION
21, 22, 23, OCTOBER 1957
and
COURSE IN POSTGRADUATE GASTROENTEROLOGY
24, 25, 26 OCTOBER 1957

THE SOMERSET
400 Commonwealth Avenue
Boston, Mass.

Members of the medical profession are cordially invited to attend the convention sessions

Attendance at the Postgraduate Course is limited to those who have paid the matriculation fee

BOARD OF TRUSTEES AND OFFICERS

Chairman
JAMES T. NIX, M.D.
New Orleans, La.

President
ARTHUR A. KIRCHNER, M.D.
Los Angeles, Calif.

President-elect
C. WILMER WIRTS, M.D.
Philadelphia, Pa.

1st Vice President
FRANK J. BORRELLI, M.D.
New York, N. Y.

2nd Vice President
JOSEPH SHAIKEN, M.D.
Milwaukee, Wisc.

3rd Vice President
HENRY BAKER, M.D.
Boston, Mass.

4th Vice President
LOUIS OCHS, Jr., M.D.
New Orleans, La.

Secretary-General
LYNN A. FERGUSON, M.D.
Grand Rapids, Mich.

Secretary
THEODORE S. HEINEKEN, M.D.
Bloomfield, N. J.

Treasurer
WILLIAM C. JACOBSON, M.D.
New York, N. Y.

Editor
SAMUEL WEISS, M.D.
New York, N. Y.

Chmn. Bd. of Governors
HENRY G. RUDNER, Sr., M.D.
Memphis, Tenn.

HARRY BAROWSKY, M.D.
New York, N. Y.
ROBERT R. BARTUNEK, M.D.
Cleveland, Ohio
YVES CHAPUT, M.D.
Montreal, Canada
DONALD C. COLLINS, M.D.
Los Angeles, Calif.
HARRY M. EBERHARD, M.D.
Philadelphia, Pa.
I. R. JANKELSON, M.D.
Boston, Mass.
MURREL H. KAPLAN, M.D.
New Orleans, La.

S. BERNARD KAPLAN, M.D.
Newark, N. J.
EDWARD J. KROL, M.D.
Chicago, Ill.
MILTON J. MATZNER, M.D.
Brooklyn, N. Y.
JOHN M. McMAHON, M.D.
Bessemer, Ala.
FERNANDO MILANES, M.D.
Havana, Cuba
H. NECHELES, M.D.
Chicago, Ill.
LOUIS L. PERKEL, M.D.
Jersey City, N. J.
M. E. STEINBERG, M.D.
Portland, Ore.

Honorary President
ANTHONY BASSLER, M.D.
New York, N. Y.

Executive Director
DANIEL WEISS, B.S., M.A.
33 West 60th St.
New York, N. Y.

PROGRAM COMMITTEE

HENRY BAKER, M.D., Chairman
Boston, Mass.

DALE W. CREEK, M.D.
Santa Barbara, Calif.
LOUIS OCHS, Jr., M.D.
New Orleans, La.

EDWARD J. KROL, M.D.
Chicago, Ill.

LYNN A. FERGUSON, M.D
Grand Rapids, Mich.
ANTHONY BASSLER, M.D.
New York, N. Y.

REGISTRATION—All members and guests should register. Identification badges for admittance to meetings will be given to those who register. These should be worn at all times during the session. Registration will take place at the registration desk on the convention floor. Registration facilities will open at 1:00 P.M. on Sunday and at 8:30 each morning.

LADIES REGISTRATION—At the registration desk on the Convention Floor. Registration facilities will be open at 1:00 P.M. on Sunday and at 8:30 each morning. Information concerning the various activities and events will be available there.

MEETINGS are held on local time and will begin promptly at the time specified.

COURSE IN POSTGRADUATE GASTROENTEROLOGY—Admittance only upon presentation of official matriculation card.

SCIENTIFIC EXHIBITS—Will be in the Exhibit Hall and will be open Monday, Tuesday, and Wednesday 8:30 a.m. to 5:00 p.m., Thursday from 8:30 a.m. to 2:00 p.m.

TECHNICAL EXHIBITS under the direction of Mr. Steven K. Herlitz, Exhibit Manager, will be open Monday, Tuesday, and Wednesday from 8:30 a.m. to 5:00 p.m., Thursday from 8:30 a.m. to 2:00 p.m.

Those attending the Convention are urged to take advantage of the time in between the presentation of papers and sessions, to visit the technical exhibits and become acquainted with the many new products and new equipment on display.

VISIT THE EXHIBITS

PROGRAM

TWENTY-SECOND ANNUAL CONVENTION
AMERICAN COLLEGE OF GASTROENTEROLOGY

SCIENTIFIC SESSIONS
21, 22, 23 October 1957

and

COURSE IN POSTGRADUATE GASTROENTEROLOGY
24, 25, 26 October 1957

THE SOMERSET
400 Commonwealth Avenue
Boston, Mass.

SPEAKERS

ALLEN, ARTHUR W., A.B., M.D., Sc.D. (Hon.), Boston, Mass. Consultant in Surgery, Massachusetts General Hospital. *(p. 22).*

ANGELO, GASPAR, M.D., F.I.C.S., Cambridge, Mass. Assistant in Surgery (Proctology), Tufts University School of Medicine; Surgeon (Proctology), Mt. Auburn and Cambridge City Hospitals. *(p. 26).*

ARIAS, IRWIN M., B.S., M.D., New York, N. Y. Instructor in Medicine, Albert Einstein College of Medicine, Yeshiva University; Assistant Visiting Physician, Bronx Municipal Hospital Center. *(p. 21).*

ATKINSON, ROSSER P., M.D., Boston, Mass. Department of Neuropsychiatry, Lahey Clinic. *(p. 9).*

BALAKRISHNA, HEGDE, M.D., Los Angeles, Calif. Fellow in Medicine, University of Southern California School of Medicine. *(p. 26).*

BATY, JAMES MARVIN, A.B., M.D., Boston, Mass. Professor and Chairman, Department of Pediatrics, Tufts University School of Medicine; Physician-in-Chief, The Boston Floating Hospital. *(p. 21).*

BECKER, IRVIN M., M.D., Milwaukee, Wis. Instructor in Medicine, Marquette University School of Medicine. *(p. 13).*

BOUDET, LINO, M.D., Vedado, Havana, Cuba. Department of Radiology, Calixto Garcia and Anglo-American Hospitals. *(p. 17).*

BOYD, LINN J., M.D., F.A.C.P., F.A.C.G. (Hon.), New York, N. Y. Professor and Director of Medicine, New York Medical College, Flower-Fifth Avenue Hospitals. *(p. 16).*

BUNKER, JOHN P., A.B., M.D., Boston, Mass. Assistant Clinical Professor of Anesthesia, Harvard Medical School; Associate Anesthetist, Massachusetts General Hospital. *(p. 14).*

BYRNE, JOHN J., A.B., M.D., Boston, Mass. Associate Professor of Surgery, Boston University School of Medicine; Director, Third (B.U.) Surgical Service and Research Laboratory, Boston City Hospital. *(p. 22).*

CHALMERS, THOMAS C., M.D., Boston, Mass. Clinical Associate in Medicine, Harvard Medical School; Chief of Medicine, Lemuel Shattuck Hospital. *(p. 14).*

CREEK, DALE W., A.B., M.D., F.A.C.G., Santa Barbara, Calif. Medical Staff, The Sansum Medical Clinic, Santa Barbara Cottage, Santa Barbara County General and St. Francis Hospitals. *(p. 17).*

CULVER, PERRY J., A.B., M.D., Boston, Mass. Associate in Medicine, Harvard Medical School; Assistant Physician, Massachusetts General Hospital. *(p. 11).*

DAMESHEK, WILLIAM, M.D., Boston, Mass. Professor of Medicine, Tufts University School of Medicine; Hematologist-in-Chief, New England Center Hospital. *(p. 23).*

DAVIDSON, CHARLES S., M.D., Boston, Mass. Associate Professor of Medicine, Harvard Medical School; Assistant Director, Second and Fourth Medical Service (Harvard), Boston City Hospital. *(p. 15).*

DEALY, JAMES, M.D., Boston, Mass. Assistant Clinical Professor of Radiology, Harvard Medical School and Acting Radiologist-in-Chief, Peter Bent Brigham Hospital. *(p. 13).*

DESFORGES, JANE, M.D., Boston, Mass. Assistant Professor of Medicine, Tufts University School of Medicine; Assistant Director, Tufts Medical Service; Assistant Director, Tufts Hematology Unit; Physician-in-Charge, R. H. Laboratory, Boston City Hospital. *(p. 15).*

DONALDSON, GORDON, A.B., M.D., Boston, Mass. Instructor in Surgery, Harvard Medical School; Associate Visiting Surgeon, Massachusetts General Hospital. *(p. 22).*

DONALDSON, ROBERT M., Jr., B.S., M.D., Boston, Mass. Assistant in Medicine, Boston University School of Medicine; Resident in Medicine, Boston Veterans Administration Hospital. *(p. 20).*

DREILING, DAVID A., A.B., M.D., New York, N. Y. Assistant Professor of Clinical Surgery, Albert Einstein College of Medicine of Yeshiva University; Assistant Attending Surgeon, The Mt. Sinai Hospital. *(p. 23).*

DUNPHY, J. ENGLEBERT, M.D., Boston, Mass. Professor of Surgery, Harvard Medical School; Director, Fifth Surgical Service and Sears Surgical Laboratory, Boston City Hospital. *(p. 15).*

DWIGHT, RICHARD W., M.D., Boston, Mass. Associate Professor of Clinical Surgery, Boston University School of Medicine; Lecturer in Surgery, Tufts University School of Medicine; Assistant Chief, Surgical Service, Boston Veterans Administration Hospital. *(p. 20).*

FINE, JACOB, A.B., M.D., Boston, Mass. Professor of Surgery, Harvard Medical School; Director of Surgery, Beth Israel Hospital. *(p. 15).*

FRIEND, DALE G., B.A., M.S., M.D., Boston, Mass. Associate in Medicine, Harvard Medical School; Senior Associate in Medicine, Peter Bent Brigham Hospital. *(p. 12).*

GARDNER, F. H., B.S., M.D., Boston, Mass. Assistant Professor of Medicine, Harvard Medical School; Senior Associate in Medicine, Peter Bent Brigham Hospital. *(p. 20).*

GLICKMAN, IRVING, B.S., D.M.D., Boston, Mass. Professor and Head of Department, Oral Pathology and Periodontology, Tufts University School of Dental Medicine. *(p. 26).*

GRAY, SEYMOUR J., M.D., Ph.D., Boston, Mass. Assistant Professor of Medicine, Harvard Medical School; Senior Associate in Medicine, Peter Bent Brigham Hospital. *(pp. 9, 13, 23).*

HAUCH, EDWARD W., M.D., Los Angeles, Calif. Department of Medicine, University of Southern California School of Medicine. *(p. 26).*

HEINZ, ERICH, M.D., Boston, Mass. Associate Professor of Biochemistry and Nutrition. Tufts University School of Medicine. *(p. 11).*

HYMAN, SAMUEL, M.S., M.D., Chicago, Ill. Assistant Professor of Medicine, Northwestern University School of Medicine, *(p. 17).*

INGELFINGER, FRANZ J., M.D., Boston, Mass. Associate Professor of Medicine, Boston University School of Medicine; Visiting Physician, Massachusetts Memorial Hospitals. *(pp. 12, 20).*

JANDL, JAMES H., M.D., Boston, Mass. Associate in Medicine, Harvard Medical School. *(p. 19).*

JANKELSON, O. M., M.D., Boston, Mass. First and Third (Tufts) Medical Service, Boston City Hospital. *(p. 24).*

JANOWITZ, HENRY D., A.B., M.D., New York, N. Y. Associate Attending in Gastroenterology and Chief, Gastroenterology Clinic, The Mt. Sinai Hospital. *(p. 23).*

KANIN, HARRY J., M.D., Milwaukee, Wis. *(p. 13).*

KEEFER, CHESTER S., B.S., M.S., M.D., D.Sc. (Hon.), F.A.C.G. (Hon.), Boston, Mass. Wade Professor of Medicine, Boston University School of Medicine; Physician-in-Chief, Massachusetts Memorial Hospitals. *(p. 11).*

KIEFER, EVERETT D., M.D., Boston, Mass. Department of Gastroenterology, Lahey Clinic. *(p. 9).*

KRAMER, PHILIP, M.D., Boston, Mass. Assistant Professor of Medicine, Boston University School of Medicine; Associate Visiting Physician, Massachusetts Memorial Hospitals. *(p. 12).*

LINTON, ROBERT, M.D., Brookline, Mass. Assistant Clinical Professor of Surgery, Harvard Medical School; Visiting Surgeon, Massachusetts General Hospital. *(p. 15).*

MAC MAHON, H. EDWARD, M.D., Sc.D., M.R.C.P., Boston, Mass. Professor of Pathology, Tufts University School of Medicine; Pathologist, New England Medical Center. *(p. 24).*

McDERMOTT, WILLIAM V., Jr., A.B., M.D., Boston, Mass. Clinical Associate Surgeon, Harvard Medical School; Assistant Surgeon, Massachusetts General Hospital. *(p. 19).*

McKITTRICK, LELAND S., B.S., M.D., Brookline, Mass. Clinical Professor of Surgery, Harvard Medical School; Consulting and Visiting Surgeon, Massachusetts General Hospital. *(p. 19).*

McNIECE, KENNETH J., B.S., M.D., Santa Barbara, Calif. Medical Staff, The Sansum Medical Clinic, Santa Barbara Cottage, Santa Barbara County General and St. Francis Hospitals. *(p. 17).*

MEISSNER, WILLIAM A., M.D., Boston, Mass. Pathologist, New England Deaconess Hospital. *(pp. 9, 19).*

MERSHEIMER, WALTER L., M.D., F.A.C.G., F.A.C.S., New York, N. Y. Associate Professor of Surgery, New York Medical College, Flower-Fifth Avenue Hospitals. *(p. 16).*

MILLER, GEORGE FRANCIS, A.B., M.D., Brookline, Mass. Associate Professor of Surgery, Boston University School of Medicine; Visiting Surgeon, Boston City Hospital. *(p. 24).*

NELSON, LAWRENCE M., M.D., M.S., B.S.C., Santa Barbara, Calif. Santa Barbara Cottage, Santa Barbara County General and St. Francis Hospitals. *(p. 17).*

NIGHTINGALE, EDWARD J., M.D., F.A.C.G., New York, N. Y. Assistant Professor of Medicine, New York Medical College, Flower-Fifth Avenue Hospitals. *(p. 16).*

OLSON, THOMAS E., B.S., M.D., Boston, Mass. Research Fellow in Medicine, Harvard Medical School; Assistant in Medicine, Peter Bent Brigham Hospital. *(p. 9).*

PATTERSON, JAMES F., B.S., M.D., Boston, Mass. Assistant Professor of Medicine, Tufts University School of Medicine, Physician, New England Center Hospital. *(p. 25).*

PAPPER, SOLOMON, A.B., M.D., Boston, Mass. Associate Clinical Professor of Medicine, Tufts University School of Medicine; Instructor in Medicine, Harvard Medical School; Chief of Metabolism, Boston Veterans Administration Hospital. *(p. 23).*

PERKEL, LOUIS L., M.D., F.A.C.P., F.A.C.G., Jersey City, N. J. Professor of Gastroenterology, Seton Hall College of Medicine; Director, Department of Gastroenterology, Jersey City Medical Center. *(p. 17).*

PROGER, SAMUEL, B.S., M.D., D.Sc. (Hon.), Boston, Mass. Professor of Medicine, Tufts University School of Medicine; Physician-in-Chief, New England Center Hospital. *(p. 25).*

RELMAN, ARNOLD S., A.B., M.D., Boston, Mass. Associate Professor of Medicine, Boston University School of Medicine; Visiting Physician, Massachusetts Memorial Hospitals. *(p. 10).*

ROBBINS, STANLEY, B.S., M.D., Boston, Mass. Associate Professor of Pathology, Boston University School of Medicine; Associate Director, Mallory Institute of Pathology; Lecturer, Harvard Medical School and Tufts University School of Medicine. *(p. 25).*

ROSS, DONALD E., M.D., F.R.C.S. (Eng.), F.R.C.S. (Edin.), F.A.C.S., F.I.C.S., F.A.C.G., Los Angeles, Calif. Teaching Staff, Queen of Angels Hospital; Chief Surgical Consultant, Queen of Angels Hospital Clinic; Chief Surgeon, Ross-Loos Medical Group. *(p. 18).*

ROSSIEN, A. XERXES, M.D., F.A.C.G., Kew Gardens, N. Y. Assistant Clinical Professor of Medicine, New York Medical College; Gastroenterologist, Triboro Hospital; Consultant Gastroenterologist, Queens General Hospital. *(p. 12).*

RUBIN, SAMUEL H., M.D., F.A.C.P., Asbury Park, N. J. Clinical Associate in Medicine, New York Medical College; Assistant Physician, Flower-Fifth Avenue Hospitals; Attending Physician and Director of Medical Education, Fitkin Hospital. *(p. 16).*

SANZ, CARLOS J., M.D., Vedado, Havana, Cuba. Calixto Garcia Hospital; Clinic "El Sagrado Corazon". *(p. 17).*

SCHATZKI, RICHARD, M.D., Boston, Mass. Clinical Associate in Radiology, Harvard Medical School; Chief, Department of Radiology, Mt. Auburn Hospital. *(pp. 12, 21).*

SCHULTZ, E. NED, M.D., Los Angeles, Calif. Fellow in Gastroenterology, University of Southern California School of Medicine. *(p. 26).*

SCHWARTZ, WILLIAM B., M.D., Boston, Mass. Associate Professor of Medicine, Tufts University School of Medicine; Physician, New England Center Hospital. *(p. 13).*

SHUTKIN, MICHAEL W., M.D., F.A.C.P., F.A.C.G., Milwaukee, Wis. Assistant Clinical Professor of Medicine, Marquette University School of Medicine; Senior Attending Physician, Milwaukee County, Mt. Sinai and St. Lukes Hospitals. *(p. 13).*

SHWACHMAN, HARRY, M.D., Boston, Mass. Assistant Professor of Pediatrics, Harvard Medical School; Chief, Clinical Laboratories, Children's Hospital. *(p. 16).*

SMITHWICK, R. H., M.D., Boston, Mass. Professor of Surgery, Boston University School of Medicine; Surgeon-in-Chief, Massachusetts Memorial Hospitals. *(pp. 18, 22).*

SNAPPER, I., M.D., Ph.D., F.A.C.G. (Hon.), Brooklyn, N. Y. Director of Medical Education, Beth-El Hospital. *(p 19).*

SOLOMON, PHILIP, B.S., M.D., Brookline, Mass. Assistant Clinical Professor of Psychiatry, Harvard Medical School; Director, Psychiatry Service, Boston City Hospital. *(p. 21).*

SOUTTER, LAMAR, M.D., Boston, Mass. Associate Professor of Surgery, Boston University School of Medicine; Visiting Physician, Massachusetts Memorial Hospitals. *(p. 12).*

STANTON, ARNOLD, M.D., F.A.C.P., Richmond Hill, N. Y. Physician, Jamaica Hospital; Associate Physician, Queens General Hospital. *(p. 12).*

STARE, FREDRICK J., Ph.D., M.D., Boston, Mass. Professor of Nutrition, Harvard Medical School; Medical Associate, Peter Bent Brigham Hospital. *(p. 25).*

VISIT THE EXHIBITS

STEIGMANN, FREDERICK, M.S., M.D., F.A.C.G., Chicago, Ill. Associate Professor of Medicine, University of Illinois Medical School. *(p. 17).*

SWENSON, ORVAR, A.B., M.D., Boston, Mass. Clinical Professor of Pediatric Surgery, Tufts University School of Medicine, Surgeon-in-Chief, The Boston Floating Hospital. *(p. 10).*

SWINTON, NEIL W., M.D., Boston, Mass. Department of Surgery and Proctology, Lahey Clinic. *(p. 9).*

TOMKINS, WILLIAM, A.B., M.D., Boston, Mass. Resident Surgeon, Third (B.U.) Surgical Service, Boston City Hospital. *(p. 24).*

VON EIGEN, PAUL R., B.S., M.D., Leominster, Mass. Formerly Resident in Medicine, Boston Veterans Administration Hospital. *(p. 20).*

WANGENSTEEN, OWEN H., B.A., M.D., Ph.D., Minneapolis, Minn. Professor and Chairman, Department of Surgery, University of Minnesota School of Medicine. *(p. 19).*

WARREN, RICHARD, M.D., Boston, Mass. Clinical Professor of Surgery, Harvard Medical School, Surgeon, Peter Bent Brigham Hospital. *(p. 13).*

WARTHIN, THOMAS A., A.B., M.D., West Roxbury, Mass. Associate Clinical Professor of Medicine, Harvard Medical School, Chief, Medical Service, Veterans Administration Hospital; Senior Associate in Medicine, Peter Bent Brigham Hospital. *(pp. 13, 18).*

WEINGARTEN, MICHAEL, M.D., F.A.C.G., New York, N. Y. Attending Physician, Beth-Israel Hospital. *(p. 11).*

WEINSTEIN, JACOB J., B.S., Ph.G., M.D., F.A.C.S., F.I.C.S., F.A.C.G., F.I.A.P., Washington, D.C. Associate in Surgery, George Washington University School of Medicine; Associate in Surgery, District of Columbia General and Garfield Memorial Hospitals; Associate in Surgical Research, Garfield Memorial Hospital; Senior Attending Surgeon, The Doctors Hospital. *(p. 16).*

WEINSTEIN, LOUIS, Ph.D., M.D., Newtonville, Mass. Professor of Medicine, Tufts University School of Medicine; Senior Physician and Chief, Infectious Disease Service, New England Medical Center Hospital. *(p. 15).*

WEISS, JEROME, B.S., M.D., F.A.C.G., New York, N. Y. Instructor in Gastroenterology and Attending Gastroenterologist (OPD), New York Polyclinic Medical School and Hospital; Assistant Visiting Physician, Second (Cornell) Division, Bellevue Hospital; Assistant Physician in Medicine, Montefiore Hospital; Associate Physician (Gastroscopy), Goldwater Hospital. *(p. 13).*

WELCH, CLAUDE E., A.B., M.A., M.D., Sc.D., Boston, Mass. Clinical Associate in Surgery, Harvard Medical School; Visiting Surgeon, Massachusetts General Hospital. *(p. 10).*

WHARTON, GEORGE K., M.D., F.A.C.G., Los Angeles, Calif. Clinical Professor of Medicine, University of Southern California School of Medicine. *(p. 26).*

ZAMCHECK, NORMAN, M.D., Boston, Mass. Instructor in Medicine, Harvard Medical School; Director of Gastrointestinal Research Laboratory, Mallory Institute of Pathology; Research Associate, Department of Pathology, Boston University School of Medicine. *(pp. 15, 19).*

ZETZEL, LOUIS, A.B., M.D., Boston, Mass. Clinical Associate in Medicine, Harvard Medical School; Visiting Physician and Chief, Gastroenterology Clinic, Beth-Israel Hospital. *(p. 9).*

Business Sessions

SATURDAY, 19 OCTOBER 1957

All Day

Various committee meetings at times and places to be arranged by committee chairmen.

SUNDAY, 20 OCTOBER 1957

9:00 A.M.

Annual Meeting of the Board of Trustees—Drawing Room.

1:00 P.M.

Luncheon, Board of Trustees and Board of Governors.

3:00 P.M.

Annual Meeting of the American College of Gastroenterology—Cleveland-Plaza Rooms.

6:30 P.M.

CONVOCATION: Presentation of Certificates—Louis XIV Ballroom. See special program.

8:30 P.M.

Buffet Supper—Madison Room. Sponsored by William H. Rorer, Inc. (Admission by card only, to be obtained at the Convocation Ceremony).

MONDAY, 21 OCTOBER 1957

5:00 P.M.

Meeting of the Credentials Committee—Drawing Room.

TUESDAY, 22 OCTOBER 1957

4:00 P.M.

Annual Meeting of the Board of Governors—Drawing Room.

WEDNESDAY, 23 OCTOBER 1957

12:30 P.M.

Luncheon meeting of the Board of Trustees—Colony Room.

VISIT THE EXHIBITS

SCIENTIFIC SESSIONS

FIRST SESSION

MONDAY MORNING, 21 OCTOBER 1957

8:30 A.M. *Coffee and doughnuts will be served in the Exhibit Area with the compliments of the House of Seagram.*

ARTHUR A. KIRCHNER, M.D., F.A.C.G., President, American College of Gastroenterology, presiding.

9:00 A.M.

1. "Serotonin and Gastroenterology".

Speakers

DR. THOMAS E. OLSON, Boston, Mass. and DR. SEYMOUR J. GRAY, Boston, Mass.

9:20 A.M.

Discussion to be opened by:

DR. JACOB LICHSTEIN, Los Angeles, Calif.

9:30 A.M.

2. "Ileitis—Twenty-five Years Later".

Speaker

DR. LOUIS ZETZEL, Boston, Mass.

9:50 A.M.

Discussers:

DR. SHELDON C. SOMMERS, Boston, Mass.
DR. LEON GINZBURG, New York, N. Y.

10:00 A.M. Recess to visit the commercial, technical and scientific exhibits.

10:30 A.M.

3. PANEL DISCUSSION ON CHRONIC ULCERATIVE COLITIS.

Moderator

DR. EVERETT D. KIEFER, Boston, Mass.

Participants

DR. NEIL W. SWINTON, Boston, Mass.
DR. ROSSER P. ATKINSON, Boston, Mass.
DR. WILLIAM A. MEISSNER, Boston, Mass.

VISIT THE EXHIBITS

11:30 A.M.—Question and answer period.

11:45 A.M.

4. "Potassium Depletion and Renal Disease in Patients with Chronic Diarrhea".

Speaker

DR. ARNOLD S. RELMAN, Boston, Mass.

12:05 P.M.

Discussion to be opened by:

DR. MAURICE STRAUSS, Boston, Mass.

12:30 P.M.

LUNCHEON—Sponsored by Burton, Parsons & Co.
(admission by card only, to be obtained at the registration desk).

Speaker to be announced.

SECOND SESSION

MONDAY AFTERNOON, 21 OCTOBER 1957

JOSEPH SHAIKEN, M.D., F.A.C.G., Vice-President, American College of Gastroenterology, presiding.

2:00 P.M.

5. "Diverticulitis of the Colon".

Speaker

DR. CLAUDE E. WELCH, Boston, Mass.

2:20 P.M.

Discussion to be opened by:

DR. JOHN W. SPELLMAN, Brookline, Mass.

2:30 P.M.

6. "Ten-Year Follow-up on 200 Patients Treated for Hirschsprung's Disease".

Speaker

DR. ORVAR SWENSON, Boston, Mass.

2:50 P.M.

Discussion to be opened by:

DR. JOHN M. CRAIG, Boston, Mass.

3:00 P.M. Recess to visit the commercial, technical and scientific exhibits.

3:30 P.M.

7. "Food Poisoning".

Speaker

DR. CHESTER S. KEEFER, Boston, Mass.

3:50 P.M.

Discussion to be opened by:

DR. A. DANIEL RUBENSTEIN, Boston, Mass.

4:00 P.M.

8. "Sprue and Intestinal Absorption".

Speaker

DR. PERRY J. CULVER, Boston, Mass.

4:20 P.M.

Discussers

DR. JOHN A. BENSON, JR., Boston, Mass.
DR. HENRY COLCHER, New York, N. Y.

4:30 P.M.

9. "Tumors of the Small Intestine".

Speaker

DR. MICHAEL WEINGARTEN, New York, N. Y.

4:50 P.M.

Discussers

DR. ALLAN D. CALLOW, Boston, Mass.
DR. HELMUTH NATHAN, New York, N. Y.

THIRD SESSION

TUESDAY MORNING, 22 OCTOBER 1957

8:30 A.M. *Coffee and doughnuts will be served in the Exhibit Area with the compliments of the House of Seagram.*

FRANK J. BORRELLI, M.D., F.A.C.G., Vice-President, American College of Gastroenterology, presiding.

9:00 A.M.

10. "Biochemical Aspects of Gastric Acid Secretion".

Speaker

DR. ERICH HEINZ, Boston, Mass.

VISIT THE EXHIBITS

9:20 A.M.

Discussers

Dr. Richard P. Durbin, Boston, Mass.
Dr. Maxwell R. Berry, Atlanta, Ga.

9:30 A.M.

11. "A Critical Evaluation of Roentgenology and Gastroscopy in the Diagnosis of Gastric Disorders".

Speakers

Dr. A. Xerxes Rossien, Kew Gardens, N. Y. and Dr. Arnold Stanton, Richmond Hill, N. Y.

9:50 A.M.

Discussers:

Dr. Edward B. Benedict, Boston, Mass.
Dr. Asher Winkelstein, New York, N. Y.

10:00 A.M. Recess to visit the commercial, technical and scientific exhibits.

10:30 A.M.

12. "Iatrogenic Diseases of the Gastrointestinal Tract".

Speaker

Dr. Dale G. Friend, Boston, Mass.

10:50 A.M.

Discussion to be opened by:

Dr. H. Edward MacMahon, Boston, Mass.

11:00 A.M.

13. PANEL DISCUSSION ON DISEASES OF THE ESOPHAGUS.

Moderator

Dr. Franz J. Ingelfinger, Boston, Mass.

Participants

Dr. Philip Kramer, Boston, Mass.
Dr. Lamar Soutter, Boston, Mass.
Dr. Richard Schatzki, Cambridge, Mass.

12:00 Noon—Question and answer period.

FOURTH SESSION

TUESDAY AFTERNOON, 22 OCTOBER 1957

HENRY BAKER, M.D., F.A.C.G., Vice-President, American College of Gastroenterology, presiding.

2:00 P.M.

14. PANEL DISCUSSION ON PEPTIC ULCER.

Moderator

DR. SEYMOUR J. GRAY, Boston, Mass.

Participants

DR. THOMAS A. WARTHIN, West Roxbury, Mass.
DR. RICHARD WARREN, Boston, Mass.
DR. JAMES DEALY, Boston, Mass.

3:00 P.M.—Question and answer period.

3:15 P.M. Recess to visit the commercial, technical and scientific exhibits.

3:45 P.M.

15. "Acid-Base Disorders in Gastrointestinal Disease".

Speaker

DR. WILLIAM B. SCHWARTZ, Boston, Mass.

4:05 P.M.

Discussion to be opened by:

DR. JOHN P. MERRILL, Boston, Mass.

4:15 P.M.

16. "A New Concept of Ulcer Management".

Speaker

DR. JEROME WEISS, New York, N. Y.

4:35 P.M.

Discussion to be opened by:

DR. ROBERT R. BARTUNEK, Cleveland, Ohio

4:45 P.M.

17. "Clinical and Experimental Observations in Peptic Ulcer with a Prolonged Acting New Anticholinergic Drug".

Speakers

DR. MICHAEL W. SHUTKIN, Milwaukee, Wis., DR. IRVIN M. BECKER, Milwaukee, Wis. and DR. HARRY J. KANIN, Milwaukee, Wis.

VISIT THE EXHIBITS

5:05 P.M.

Discussers

Dr. Edward E. Woldman, Cleveland, Ohio
Dr. Edward A. Marshall, Cleveland, Ohio

7:30 P.M.

TWENTY-FIFTH ANNUAL BANQUET—Louis XIV Ballroom, The Somerset, Boston, Mass.

FIFTH SESSION

WEDNESDAY MORNING, 23 OCTOBER 1957

8:30 A.M. *Coffee and doughnuts will be served in the Exhibit Area with the compliments of the House of Seagram.*

Dwight E. Harken, M.D., F.A.C.G., presiding.

9:00 A.M.

18. "Choice of Anesthesia for Patients with Liver Disease".

Speaker

Dr. John P. Bunker, Boston, Mass.

9:20 A.M.

Discussion to be opened by:

Dr. Urban H. Eversole, Boston, Mass.

9:30 A.M.

19. "Dietary Management of Liver Disease".

Speaker

Dr. Thomas C. Chalmers, Boston, Mass.

9:50 A.M.

Discussers

Dr. Walter W. Point, Boston, Mass.
Dr. A. I. Friedman, Hackensack, N. J.

10:00 A.M. Recess to visit the commercial, technical and scientific exhibits.

VISIT THE EXHIBITS

10:30 A.M.

20. PANEL DISCUSSION ON THE MANAGEMENT OF MASSIVE GASTROINTESTINAL HEMORRHAGE IN PATIENTS WITH LIVER DISEASE.

Moderator

DR. NORMAN ZAMCHECK, Boston, Mass.

Participants

DR. CHARLES S. DAVIDSON, Boston, Mass.
DR. JANE DESFORGES, Boston, Mass.
DR. J. ENGLEBERT DUNPHY, Boston, Mass.
DR. ROBERT LINTON, Brookline, Mass.

11:45 A.M.—Question and answer period.

SIXTH SESSION

WEDNESDAY AFTERNOON, 23 OCTOBER 1957

LOUIS OCHS, JR., M.D., F.A.C.G., Vice-President, American College of Gastroenterology, presiding.

2:00 P.M.

21. "The Role of the Intestine in Traumatic Shock".

Speaker

DR. JACOB FINE, Boston, Mass.

2:20 P.M.

Discussion to be opened by:

DR. MONTO HO, Boston, Mass.

2:30 P.M.

22. "The Impact of Antibiotics on the Gastrointestinal Tract".

Speaker

DR. LOUIS WEINSTEIN, Newtonville, Mass.

2:50 P.M.

Discussion to be opened by:

DR. EDWARD KASS, Boston, Mass.

3:00 P.M. Recess to visit the commercial, technical and scientific exhibits.

VISIT THE EXHIBITS

3:30 P.M.

23. "Cystic Fibrosis of the Pancreas—Diagnosis and Treatment".

Speaker

DR. HARRY SHWACHMAN, Boston, Mass.

3:50 P.M.

Discussion to be opened by:

DR. CHARLES A. JANEWAY, Boston, Mass.

4:00 P.M.

24. "Observations on Pancreatic Carcinoma: A Study of 100 Cases".

Speakers

DR. EDWARD J. NIGHTINGALE, New York, N. Y., DR. LINN J. BOYD, New York, N. Y. and DR. WALTER L. MERSHEIMER, New York, N. Y.

4:20 P.M.

Discussion to be opened by:

DR. N. W. CHAIKIN, New York, N. Y.

4:30 P.M.

25. "Incidence of Pancreatitis After Gastrectomy and Relationship to Immediate Morbidity".

Speaker

DR. JACOB J. WEINSTEIN, Washington, D. C.

4:50 P.M.

Discussion to be opened by:

DR. MURREL H. KAPLAN, New Orleans, La.

SEVENTH SESSION

WEDNESDAY EVENING, 23 OCTOBER 1957

ANTHONY BASSLER, M.D., F.A.C.G., Honorary President, American College of Gastroenterology, presiding.

8:00 P.M.

26. "Bacteroides Infections in Gastroenterology".

Speakers

DR. SAMUEL H. RUBIN, Asbury Park, N. J. and DR. LINN J. BOYD, New York, N. Y.

VISIT THE EXHIBITS

8:15 P.M.

27. "Stenosis of the Pyloric Antrum of the Stomach: Benign or Malignant".

Speakers

DR. FREDERICK STEIGMANN, CHICAGO, ILL. and DR. SAMUEL HYMAN, Chicago, Ill.

8:30 P.M.

28. "Pyloric Obstruction Resulting from Corrosive Gastritis".

Speaker

DR. LOUS L. PERKEL, Jersey City, N. J.

8:45 P.M.

29. "Hypervitaminosis 'A'—Toxic Reaction".

Speakers

DR. DALE W. CREEK, Santa Barbara, Calif., DR. LAWRENCE M. NELSON, Santa Barbara, Calif. and DR. KENNETH JAY MCNIECE, Santa Barbara, Calif.

9:00 P.M.

30. "Incidence of Esophageal Varices in Cirrhosis".

Speakers

DR. CARLOS J. SANZ, Havana, Cuba and DR. LINO BOUDET, Havana, Cuba.

9:15 P.M. Recess.

9:30 P.M.

MOTION PICTURE PROGRAM

1. "Cinefluorography and Intraesophageal Pressure Studies in Neuromuscular Disorders of the Esophagus". (30 min.)

DR. FREDERICK S. CROSS and DR. GEORGE F. JOHNSON, Cleveland, Ohio.

2. "Surgical Exploration for Massive Gastrointestinal Tract Hemorrhage of Obscure Origin". (28 min.)

DR. MELVIN P. OSBORNE, DR. J. ENGLEBERT DUNPHY and DR. NORMAN ZAMCHECK, Boston, Mass.

3. "Sigmoidoscopic Motion Pictures in Color". (30 min.)

DR. WILLIAM Z. FRADKIN, Brooklyn, N. Y.

COURSE IN POSTGRADUATE GASTROENTEROLOGY

SURGICAL COORDINATOR AND CO-CHAIRMAN

OWEN H. WANGENSTEEN, B.A., M.D., Ph.D., Minneapolis, Minn.

MEDICAL COORDINATOR AND CO-CHAIRMAN

I. SNAPPER, M.D., Ph.D., F.A.C.G. (Hon.), Brooklyn, N. Y.

FIRST SESSION

THURSDAY MORNING, 24 OCTOBER 1957

Attendance at the Postgraduate Course is limited to those who have registered and paid the matriculation fee.

C. WILMER WIRTS, M.D., F.A.C.G., President, American College of Gastroenterology, presiding.

9:00 A.M.
Address of Welcome–

9:05 A.M.

1. "Stricture of the Bile Ducts".

Speaker
DR. DONALD E. ROSS, Los Angeles, Calif.

9:25 A.M.
Discussion

9:35 A.M.

2. "Medical Problems in Biliary Tract Disease".

Speaker
DR. THOMAS A. WARTHIN, West Roxbury, Mass.

9:50 A.M.

3. "Surgical Problems in Biliary Tract Disease".

Speaker
DR. REGINALD H. SMITHWICK, Boston, Mass.

10:00 A.M.
Discussion

VISIT THE EXHIBITS

10:10 A.M.

4. "Hematologic Changes in Chronic Liver Disease".

Speaker

DR. JAMES H. JANDL, Boston, Mass.

10:30 A.M.

Discussion

10:40 A.M. Recess to visit the commercial, technical and scientific exhibits. (Exhibits close at 2:00 P.M.).

11:05 A.M.

5. "Use and Abuse of Liver Function Tests".

Speaker

DR. NORMAN ZAMCHECK, Boston, Mass.

11:25 A.M.

Discussion

11:35 A.M.

6. "The Management of Hepatic Coma".

Speaker

DR. WILLIAM V. MCDERMOTT, JR., Boston, Mass.

11:55 A.M.

Discussion

SECOND SESSION

THURSDAY AFTERNOON, 24 OCTOBER 1957

Attendance at the Postgraduate Course is limited to those who have registered and paid the matriculation fee.

This entire session will be held at the Joslin Auditorium of the New England Deaconess Hospital.

2:00 P.M.

7. CLINICAL PATHOLOGICAL CONFERENCE.

Chairman

DR. LELAND S. MCKITTRICK, Boston, Mass.

Participants

DR. WILLIAM MEISSNER, Boston, Mass.
DR. OWEN H. WANGENSTEEN, Minneapolis, Minn.
DR. I. SNAPPER, Brooklyn, N. Y.

VISIT THE EXHIBITS

3:30 P.M. Recess.

3:45 P.M.

8. "Unusual Small Bowel Disorders".

Speaker

DR. FRANZ J. INGELFINGER, Boston, Mass.

4:05 P.M.

Discussion

4:15 P.M.

9. "Pathologic Physiology of Small Bowel Malabsorption".

Speaker

DR. F. H. GARDNER, Boston, Mass.

4:35 P.M.

Discussion

4:45 P.M.

10. "Islet Cell Tumor of the Pancreas and Peptic Ulcer: Case Report".

Speakers

DR. ROBERT M. DONALDSON, JR., Boston, Mass., DR. PAUL R. VONEIGEN, Leominster, Mass. and DR. RICHARD W. DWIGHT, Boston, Mass.

5:05 P.M.

Discussion

VISIT THE EXHIBITS

THIRD SESSION

FRIDAY MORNING, 25 OCTOBER 1957

Attendance at the Postgraduate Course is limited to those who have registered and paid the matriculation fee.

This session and all subsequent sessions will again be held at The Somerset.

CHARLES W. MCCLURE, M.D., F.A.C.G., Governor, American College of Gastroenterology, presiding.

9:00 A.M.

11. "Gastrointestinal Diseases in Children".

Speaker

DR. JAMES MARVIN BATY, Boston, Mass.

9:20 A.M.

Discussion

9:30 A.M.

12. "Psychoneurotic versus Psychosomatic Abdominal Pain".

Speaker

DR. PHILIP SOLOMON, Brookline, Mass.

9:50 A.M.

Discussion

10:00 A.M.

13. "Constitutional Hepatic Dysfunction (Gilbert's Disease)".

Speaker

DR. IRWIN ARIAS, New York, N. Y.

10:20 A.M.

Discussion

10:30 A.M. Recess.

10:45 A.M.

14. "Certain Problems in the Diagnosis of Gastric Ulcers".

Speaker

DR. RICHARD SCHATZKI, Boston, Mass.

11:05 A.M.

Discussion

11:15 A.M.

15. "Surgery of Duodenal Ulcer".

Speaker

DR. REGINALD H. SMITHWICK, Boston, Mass.

11:35 A.M.

Discussion

12:00 Noon

BUFFET LUNCHEON (Admission by card only).

FOURTH SESSION

FRIDAY AFTERNOON, 25 OCTOBER 1957

Attendance at the Postgraduate Course is limited to those who have registered and paid the matriculation fee.

LYNN A. FERGUSON, M.D., F.A.C.G., Secretary-General, American College of Gastroenterology, presiding.

2:00 P.M.

16. "Cancer of the Colon".

Speakers

DR. ARTHUR W. ALLEN, Boston, Mass. and DR. GORDON DONALDSON, Boston, Mass.

2:20 P.M.

Discussion

2:30 P.M.

17. "Intestinal Obstruction".

Speaker

DR. JOHN J. BYRNE, Boston, Mass.

VISIT THE EXHIBITS

2:50 P.M.

Discussion

3:00 P.M.

18. "The Role of the Kidney in Liver Disease".

Speaker

Dr. Solomon Papper, Boston, Mass.

3:20 P.M.

Discussion

3:30 P.M. Recess.

3:45 P.M.

19. "Hereditary Spherocytosis and Autoimmune Hemolytic Anemia —A Study in Contrasts".

Speaker

Dr. William Dameshek, Boston, Mass.

4:05 P.M.

Discussion

4:15 P.M.

20. "The Effect of Steroids on the Gastrointestinal Tract".

Speaker

Dr. Seymour J. Gray, Boston, Mass.

4:25 P.M.

21. "The Effect of ACTH and Adrenal Steroids on Gastric Secretion".

Speakers

Dr. David A. Dreiling, New York, N. Y. and Dr. Henry D. Janowitz, New York, N. Y.

4:35 P.M.

Discussion

VISIT THE EXHIBITS

4:45 P.M.

22. "Surgical Treatment of Massive Upper Gastrointestinal Hemorrhage".

Speakers

DR. GEORGE F. MILLER, Brookline, Mass. and DR. WILLIAM TOMKINS, Boston, Mass.

5:00 P.M.

23. "Clinical Aspects of Hemorrhagic Gastritis".

Speaker

DR. O. M. JANKELSON, Boston, Mass.

5:10 P.M.

Discussion

FIFTH SESSION

SATURDAY MORNING, 26 OCTOBER 1957

Attendance at the Postgraduate Course is limited to those who have registered and paid the matriculation fee.

HALSEY B. LODER, M.D., Boston, Mass., presiding.

9:00 A.M.

24. "Liver Patterns in 'Biliary Hypercholesteremia' ".

Speaker

DR. H. EDWARD MACMAHON, Boston, Mass.

9:20 A.M.

Discussion

9:30 A.M.

25. "Nutritional Problems of Interest to Gastroenterologists".

Speaker

Dr. Fredrick J. Stare, Boston, Mass.

9:50 A.M.

Discussion

10:00 A.M.

26. "Indigestion and Heart Disease".

Speaker

Dr. Samuel Proger, Boston, Mass.

10:20 A.M.

Discussion

10:30 A.M. Recess.

10:45 A.M.

27. "Clinical Aspects of Nutritional (Laennec's) Cirrhosis".

Speaker

Dr. Stanley Robbins, Boston, Mass.

11:05 A.M.

Discussion

11:15 A.M.

28. "Skin Lesions in Gastrointestinal Disorders".

Speaker

Dr. James F. Patterson, Boston, Mass.

11:35 A.M.

Discussion

VISIT THE EXHIBITS

SIXTH SESSION

SATURDAY AFTERNOON, 26 OCTOBER 1957

Attendance at the Postgraduate Course is limited to those who have registered and paid the matriculation fee.

JOHN M. MCGOWAN, M.D., F.A.C.G., Quincy, Mass., presiding.

2:00 P.M.

29. "Oral Mucous Membrane Lesions of Interest to the Gastroenterologist".

Speaker

DR. IRVING GLICKMAN, Boston, Mass.

2:20 P.M.

Discussion

2:30 P.M.

30. "Gastroscopy, A Five-Year Study in a Large General Hospital".

Speakers

DR. E. NED SCHULTZ, Los Angeles, Calif., DR. HEGDE BALAKRISHNA, Los Angeles, Calif., DR. EDWARD W. HAUCH, Los Angeles, Calif., and DR. GEORGE K. WHARTON, Los Angeles, Calif.

2:50 P.M.

Discussion

3:00 P.M.

31. "Anorectal Infection—Pathogenesis and Clinical Manifestations".

Speaker

DR. GASPAR ANGELO, Cambridge, Mass.

3:20 P.M.

Discussion

VISIT THE EXHIBITS

SCIENTIFIC EXHIBITS

BOOTH S-11 **"Placement Therapy: A New Approach to Around-the-Clock Treatment of Peptic Ulcer".**

DR. ARTHUR L. KASLOW, Los Angeles, Calif.

This exhibit will consist of a demonstration of alumnium hydroxide medications gradually released from a slow-dissolving pellet. The pellet is attached to a string and suspended in the esophagus or stomach at various levels as desired to approximate the target lesion. There will be x-ray pictures of pellets as they appear in the stomach in clinical cases and charts of comparative methods of antacid therapy.

BOOTH S-20 **"Reconstruction of the Upper Gastrointestinal Tract with Segments of Colon".**

DR. WILLIAM E. NEVILLE and DR. GEORGE H. A. CLOWES, Cleveland, Ohio.

This exhibit depicts with color transparency the technic for reconstruction of the esophagus and the stomach with segments of the colon. Postoperative x-rays of patients followed up to 36 months are included. The indications, the complications and results are discussed.

Autopsy specimens of patients are presented along with experimental evidence to show that the colon is resistant to acid peptic ulceration. The history of the operation and the various methods for esophageal reconstruction are discussed. The advantages of using the colon as an esophageal substitute are presented.

BOOTH S-21 **"Cystic Fibrosis of the Pancreas".**

DR. HARRY SHWACHMAN, Boston, Mass.

This exhibit will cover the incidence, clinical manifestations, pathologic findings and pathogenesis, diagnostic procedures emphasizing pancreatic function tests and the newly described sweat test, therapy and prognosis. The exhibit will be illustrated with charts, graphs, and photomicrographs.

BOOTH S-34 **"Effective Antiemetic Agents".**

DR. JOHN H. MOYER, Philadelphia, Pa., DR. PAUL K. CONNOR, JR., Houston, Texas and DR. JAMES B. DONALDSON, HOUSTON, TEXAS.

The exhibit is a description of the pharmacodynamics of currently available effective antiemetic agents. Based on these pharmacodynamic observations, we have outlined the practical use of these agents for various causes of nausea and vomiting. A detailed brochure accompanies the exhibit describing the specific drug to be used and the best manner for administering this drug.

BOOTHS S-35 & 36 **"Functional Constipation: Diagnostic and Therapeutic Considerations".**

DR. FREDERICK STEIGMANN and DR. MILTON MILLER, Chicago, Ill.

With the aid of diagrams, a review of the different types of chronic (functional) constipation will be presented. The different substances and regimens used for relief of this type of constipation will be presented and discussed on the basic of their physiological and pharmacological activities. The development of, and clinical and laboratory observations on a new substance helpful in the management of chronic (functional) constipations will be described. The pharmacological basis for the activities of this new substance will be presented, and its effect will be shown by roentgenograms and charts.

BOOTHS S-37 & 38 **"Ion-Exchange Resin Therapy in the Diarrheal Syndrome".**

DR. JEROME WEISS, DR. SAMUEL WEISS and DR. BERNARD WEISS, New York, N. Y.

The main diagnostic features of chronic diarrhea are outlined and demonstrated by means of diagrams. An illustration of the digestive tract with the length of time it takes food to pass various stations of the colon is highlighted, as is a demonstration of the pathology produced in the mucosa with various forms of colitis.

The rationale, mode of action and statistical results obtained from the use of ion-exchange resin preparations in irritable colon, summer diarrhea, ulcerative colitis and antibiotic diarrhea are shown schematically and graphically. A typical case is dramatically demonstrated and described through serial x-rays.

BOOTHS S-39 & 40 **"The Current Status of Intravenous Cholecystography and Cholangiography".**

DR. J. EDWARD BERK and DR. HOWARD H. FEIGELSON, Detroit, Mich.

The development of contrast media that may be safely administered intravenously with resultant rapid opacification of the gallbladder and extrahepatic bile ducts has opened a new field in diagnostic roentgenology. As is true of most new diagnostic procedures, that of intravenous cholecystography and cholangiography has been and will probably continue to be modified and refined. This exhibit summarizes and illustrates the contrast media, the various technics and the uses and limitations of intravenous cholecystography and cholangiography.

BOOTHS S-44 & 45 **"Clinical Significance of Uropepsin in Gastrointestinal Disease".**

DR. J. ALFRED RIDER, DR. HUGO C. MOELLER, DR. JOHN O. GIBBS, JOYCE SWADER, DR. LOURDES F. AGCAOILI, JERE DEROIN and DR. ALFRED ANDEREGG, San Francisco, Calif.

The uropepsin level is a simple quantitative index of gastric pepsin secretion. It varies from the normal in various diseases and disease states such as duodenal ulcer, gastric ulcer, atrophic

gastritis, hypertrophic gastritis and pernicious anemia, and after partial and total gastrectomy. There is a positive correlation between uropepsin secretion and gastric acidity. The influence of various agents, such as steroids, anticholinergic drugs, and x-ray therapy on uropepsin will be shown. The diagnostic and therapeutic implications of these effects will be presented.

BOOTH S-47 **"Tubeless Gastric Analysis: A Urinary Color Test".**

Dr. Harry L. Segal, Dr. Leon L. Miller and Elizabeth J. Plumb, Rochester, N. Y.

This exhibit demonstrates the rationale procedures and results of determining gastric acidity by the tubeless gastric analysis technic. The presence or absence of free gastric hydrochloric acid is determined by the mere visual appraisal of the color change in the urine after the oral administration of an azure A resin compound. The reasons for any inconsistencies between the intubation and tubeless technics are also recorded.

BOOTH S-48 **"Complete Nutriment in Therapy of Peptic Ulcer".**

Dr. Asher Winkelstein, New York, N. Y.

The exhibit employs color transparencies, line drawings, x-rays, charts and illustrative case histories in the cause and treatment of peptic ulcer. It includes clinical studies on the use of complete nutriment in the treatment of 40 private patients suffering from one of the following: Duodenal ulcer, gastric ulcer, combined duodenal and gastric ulcer, jejunal ulcer, peptic esophagitis, esophageal ulcer or a combination of two or more ulcers. All of the 40 patients were refractory to the conventional ulcer therapy including anticholinergic drugs, liberal ulcer diet and nonabsorbable alkalis. Both the oral therapy and the nocturnal drip therapy are described. Good results were obtained in 87 per cent of the 40 patients. Criteria of successful response included: symptomatic relief of epigastric pain and discomfort, maintenance of weight or weight gain and roentgenological evidence of healing.

BOOTH S-49 **"A Postoperative Bowel Stimulant".**

Dr. T. O. Lamphier and Dr. R. Ehrlich, Boston, Mass.

This exhibit will present data regarding the efficacy of senosides plus a wetting-agent as a bowel stimulant. The cases will be classified as to type of surgery performed, time and dosage schedule of preparation and toxicity. Pharmacology and rationale of the combination will be explained. These data will represent our results in 175 postoperative cases.

TECHNICAL EXHIBITORS

(Those attending the Convention sessions are urged to take advantage of the time in between the presentation of papers and sessions, to visit the technical exhibits and become acquainted with the many new products and new equipment on display.)

ABBOTT LABORATORIES, North Chicago, Ill., (Booth 16). *Harmonyl®*, a new tranquilizer and antihypertensive agent, will be among the new products they will exhibit. Other products to be shown will include a new therapeutic agent for peptic ulcer, *Tral®*; an aerosol solution for treatment of chronic pulmonary diseases, *Tergemist®*; an anticonvulsant for control of grand mal epilepsy, *Peganone®*; an aid in the management of atherosclerosis, *Safe*, and Abbott's complete line of intravenous solutions and equipment.

AMES COMPANY, INC., Elkhart, Ind. (Booth 25), will feature an entirely new concept in the detection and evaluation of proteinurea. The presence of protein is indicated colorimetrically by either form of this new test–Tablet–*Albutest*, or paper strip–*Albustix*. Their representatives will be in attendance to demonstrate and discuss these and other Ames Products.

BURTON, PARSONS & COMPANY, Washington, D.C., (Booth 18). You are cordially invited to visit our booth where information, samples and literature will be available on our hydrophilic colloids, *L. A. Formula* and *Konsyl*. *L. A. Formula* contains 50 per cent bulk producing material dispersed in an equal amount of lactose and dextrose. *Konsyl*, on the other hand, contains 100 per cent bulk producing material and is certainly the product of choice for the obese, the diabetic, and others with restricted caloric intake. Orange juice will also be available to prove that *L. A. Formula* is unsurpassed for palatability and literally defies detection in orange juice.

THE COCA-COLA COMPANY, Atlanta, Ga. (Lounge area). Ice-cold Coca-Cola served through the courtesy and co-operation of the Coca-Cola Bottling Company of Boston, Mass. and The Coca-Cola Company.

EDER INSTRUMENT COMPANY, INC., Chicago, Ill. (Booth 14), will again exhibit their latest developments in gastroscopic equipment. Featured will be new proctoscopic instruments and also the Shiner small intestinal biopsy tube.

ENCYCLOPAEDIA BRITANNICA, Chicago, Ill., (Booth 46), presents the new 1957 edition of Encyclopaedia Britannica. This leading reference work with its almost 200-year history has been completely revised in an intensive effort of the last 13 years, representing an investment of over $5,000,000. Illustrated in color, it contains 38,042,000 words, 23,494 illustrations, by 5,565 contributors from 75 countries, easily handled through 539,138 index references.

FROST LABORATORIES, INC., Auburndale, Mass. (Booth 31), presents the following: Large diagram of crystal structure of diglycocoll hydrochloride. This happens to be the only compound whose bond distances have been measured by a new method with an accuracy of .001 angstrom unit. . . . Large crystals of the compound. HCl-Caps bottles of 500 and 100, and our Chlorazene products will be on display as will be samples of fine chemicals we manufacture–such as ethylene diamine dihydroiodide, tetraglycine hydroperiodide.

GRAY PHARMACEUTICAL COMPANY, INC., Newton, Mass. (Booth 41). *L-Glutavite*, while being considered neither as a stimulant or as a tranquilizer, promotes a favorable change in the behavior pattern of the geriatric patient whether he be belligerent, agitated, catatonic, or depressed. *L-Glutavite* is available in three convenient dosage forms: packets, economy canisters and capsules.

Quinoplex, a neurotropic bowel tonic, promotes the return of normal peristalsis and bowel tone in patients who have become constipated because of concurrent use of hypotensive blocking agents or habitual use of harsh irritating laxatives. Clinical studies report *Quinoplex* to be effective in correcting constipation at the low dosage level of 1-2 tablets upon retiring.

LLOYD BROTHERS, INC., Cincinnati, Ohio (Booth 23). Accumulating clinical experience with *Doxinate* (dioctyl sodium sulfosuccinate, Lloyd), the original fecal softening product for treating constipation, proves that a daily dosage of 240 mg. provides consistent success in most patients. Since *Doxinate* is chemically inert and nontoxic, this higher dosage can be given with safety. *Doxinate* with *Danthron* combines fecal softening with gentle laxation. The *Doxinate* family affords the physician a complete choice of medication for the management of all types of constipation.

MALLON CHEMICAL CORPORATION, DIVISION OF DOHO CHEMICAL CORPORATION, New York, N. Y. (Booth 32), is featuring: *Rectalgan*—Liquid topical anesthesia, for relief of pain and discomfiture in hemorrhoids, pruritus and perineal suturing. *Dermoplast*—Aerosol freon propellent spray for fast relief of surface pain, itching, burns and abrasions; also obstetrical and gynecological use.

MEAD JOHNSON & COMPANY, Evansville, Ind. (Booth 4). Their exhibit is staffed with representatives trained to provide you with information about: The *Colace* products family, for the management of constipation. When bowel motility is adequate, *Colace* softens stools without laxative action. When bowel motility is inadequate, *Peri-Colace* softens stools and stimulates peristalsis. *Sustagen*, a valuable therapeutic agent in peptic ulcer because of its neutralizing ability, high-caloric, high-protein value, generous mineral and vitamin content, fluid nature and satisfactory palatability. *Sustagen* is the only single food complete in all known essential nutrients.

MEDICAL, DENTAL SCIENTIFIC PHOTOGRAPHIC EQUIPMENT CO., Levittown, N. Y. (Booth 17), presents a complete line of photographic equipment for close-up pictures. Introduces the new electronic Gastrophot for taking pictures through the gastroscope. This device is in actual use in France and the slides will be on display at the booth.

THE NATIONAL DRUG COMPANY, Philadelphia, Pa. (Booth 5).

PFIZER LABORATORIES, Brooklyn, N. Y. (Booth 26). Their exhibit spotlights its recent and original therapeutic concepts represented by *Sigmamycin* (Brand of Cleandomycin), a combination of *Matromycin* and *Tetracyn;* and the newest advance in topical corticosteroid therapy, *Magnacort* and *Neo-Magnacort*, the first water soluble corticoid. Also *Moderil*—Pfizer's new alkaloid of rauwalfia. *Ataraxoid*, the first and only ataraxic-corticoid, as well as *Bonamine* and *Sterane*.

THE PURDUE FREDERICK COMPANY, New York, N. Y. (Booth 15), will feature: *Senokot* Tablets and Granules—new non-bulk, non-irritating constipation corrective acting selectively on the parasympathetic (Auerbach's), plexus in the large bowel, physiologically stimulating the neuromuscular defecatory reflex. *Pre-Mens*—the multidimensional premenstrual tension therapy. *Somatovite*—clinically proven to promote weight gain, increase appetite and reduce hyperactivity and restlessness. *Sippyplex*—the modern comprehensive therapy for peptic ulcer.

A. H. ROBINS COMPANY, INC., Richmond, Va. (Booth 28). Physicians attending the convention are extended a cordial invitation to visit the exhibit displaying their various products. Experienced medical representatives will be in attendance to welcome them and answer inquiries relative to any of Robins prescription specialties.

ROR CHEMICAL CO., New York, N. Y. (Booth 9), will present *Romach* tablets, the new and highly effective therapy for gastric and duodenal ulcers. *Romach* tablets are fast acting and leave no side-effects, no after effects, or acid rebound. Our representative will be happy to discuss this product with you.

VISIT THE EXHIBITS

WILLIAM H. RORER, INC., Philadelphia, Pa. (Booth 33), presents: *Maalox,* the non-constipating, pleasant tasting antacid shares the spotlight at their exhibit with *Pareptectolin,* an oral anesthetic for the effective relief of nausea, vomiting and pylorospasm. Representatives are on hand to answer your questions about these and other Rorer products.

SEAGRAM DISTILLERS CO., New York, N. Y. (Booth 6). *Congeners*—Meaning—Analysis . . . Congeners (fusel oil, aldehydes, etc.) are compounds which appear in all alcoholic beverages, providing them with bouquet and color. In high concentration, they may cause undesirable after effects. This exhibit, based on analyses by Foster D. Snell, Inc., shows the variation of congeneric concentrations in leading types of alcoholic beverages. The physician who advises a patient to drink can be guided by these analyses in recommending a low congeneric beverage.

G. D. SEARLE & CO., Chicago, Ill. (Booth 13). You are cordially invited to visit the Searle booth where their representatives will be happy to answer any question regarding Searle Products of Research. Featured will be *Nilevar,* the new anabolic agent; *Rolicton,* the new safe, non-mercurial oral diuretic; *Vallestril,* the new synthetic estrogen with extremely low incidence of side reactions; *Banthine* and *Pro-Banthine,* the standards in anticholinergic therapy; and *Dramamine,* for the prevention and treatment of motion sickness and other nauseas.

SMITH, KLINE & FRENCH LABORATORIES, Philadelphia, Pa. (Booth 24).

E. R. SQUIBB & SONS, New York, N. Y. (Booth 19), has long been a leader in development of new therapeutic agents for prevention and treatment of disease. The results of their diligent research are available to the Medical Profession in new products or improvements in products already marketed. They will be pleased to present up-to-date information on these advances for your consideration.

WALLACE LABORATORIES, New Brunswick, N. J. (Booth 2), will feature *Milpath,* the new drug containing *Miltown* and the anticholinergic, Tridihexethyl iodide. *Miltown* is a proven tranquilizer affecting only the central nervous system. The anticholinergic controls abdominal activity by acting selectively on the parasympathetic system. This dual action means effective treatment of ulcers and other gastrointestinal disturbances.

WARNER-CHILCOTT LABORATORIES, Morris Plains, N. J. (Booth 42), feature *Pacatal,* the new phrenotrophic agent. *Pacatal's* tranquilizing effect is unique because it produces a deeper calm without sedation. In depressed patients, *Pacatal,* unlike other ataractic agents, produces a decided euphorogenic effect. *Pacatal* permits a normal active life for the tense, anxious or disturbed patient. Side-effects are minimal with *Pacatal,* and its dosage schedule is simple and convenient for the patient.

WYETH LABORATORIES, Philadelphia, Pa. (Booth 43).

College who have completed twenty-five years of affiliation will receive silver certificates commemorating the occasion. At the banquet also, Dr. C. Wilmer Wirts of Philadelphia will assume the Presidency and will be invested with the insignia of office by Dr. Arthur A. Kirchner of Los Angeles, the outgoing President. The dancing and entertainment is being sponsored by The Purdue Frederick Co. of New York.

This year the Program Committee was under the chairmanship of Dr. Henry Baker who has done an outstanding job in presenting a fine scientific program and postgraduate course. In addition to the program bound in this issue, copies are being mailed out to the members of the College. Additional copies are available from the headquarters office, 33 West 60th St., New York 23, N. Y.

Woman's Auxiliary Program

Mrs. Harold F. Goulston of New Bedford, Mass., chairman of this year's Woman's Auxiliary Program, and her committee have prepared a fine program for the wives and families of those doctors attending the Convention. The full details will be sent by mail.

The tentative program follows:

Sunday, 20 October 1957

Registration opens at The Somerset at 1:00 P.M. A badge is necessary to visit the exhibits.

Business meeting of the Auxiliary and election of officers at 2:30 P.M.

Welcome Tea honoring new officers and welcoming members and guests will be held at 4:00 P.M.

The Convocation Ceremony, to which the ladies are invited, takes place at 6:30 P.M.

Buffet supper 8:30 P.M.

Monday, 21 October 1957

Film: "Boston City Yesterday and Tomorrow" at 10:00 A.M.

Two-hour sightseeing tour of Boston and Cambridge leaves from the hotel at 2:00 P.M.

The evening will be open for individual activities.

Tuesday, 22 October 1957

The morning will be left open for individual activities.

Tour through the Isabella Stewart Gardner Museum with a musicale followed by High Tea. A bus will leave from the hotel at 1:30 P.M.

Cocktail party and Twenty-fifth Annual Banquet of the College at The Somerset at 7:00 P.M. This is informal, dancing and entertainment will follow.

Wednesday, 23 October 1957

Breakfast at The Somerset followed by a lecture and demonstration by Mrs. Donald Schoonover, Area Manager for the New England States Beauty Counselors, 9:30 A.M.

Business meeting to which all are welcome at 11:00 A.M.

It is anticipated that tickets for a theatre party will be available for the afternoon.

Thursday, 24 October 1957

Lecture tour through the Museum of Fine Arts at 11:00 A.M.

Reservations for all activities are required and should be made in advance.

Registration

The registration desks will be open on the Lobby Floor of The Somerset at 1:00 P.M., on Sunday, 20 October 1957. Those attending the Convention are requested to register and receive their identification badges. No one will be admitted to the exhibits or sessions without a badge.

Annual Meeting Board of Trustees

The Board of Trustees will hold its Annual Meeting at The Somerset in Boston, Mass., at 9:00 A.M., on Sunday, 20 October 1957. A joint luncheon with the Board of Governors will follow the meeting.

Annual Meeting of the American College of Gastroenterology

The Fellows and Life Fellows of the American College of Gastroenterology will hold their Annual Meeting at The Somerset in Boston, Mass., on Sunday afternoon, 20 October 1957 at 4:00 P.M. Election of Officers, Trustees and Governors and voting on amendments to the Constitution and By-laws will take place.

Convocation Ceremony

The Convocation Ceremony will be held at 6:30 P.M., on Sunday evening, 20 October 1957 at The Somerset in Boston, Mass. Dr. Chester S. Keefer will speak on "Specialism in the Days Ahead".

William H. Rorer, Inc. Buffet Supper

Tickets for the buffet supper sponsored by William H. Rorer, Inc., will be distributed only to those attending the Convocation Ceremony. The supper is scheduled to begin at 8:30 P.M. and will be in the Louis XIV Ballroom.

Scientific Exhibits

Again this year the Scientific Exhibits have been selected by a committee under the chairmanship of Dr. Michael W. Shutkin. The displays will be interspersed amongst the other exhibits on the Lobby Floor and will be open for the three days of the Convention.

Ribbons and certificates will again be awarded to the best exhibits.

Burton, Parsons & Co. Luncheon

The annual Burton, Parsons & Co. luncheon for those attending the Convention will take place at 12:30 P.M. on Monday, 21 October 1957.

Admission to the luncheon will be by ticket only which may be obtained for the asking at the registration desk on the Convention Floor.

Credentials Committee

The meeting of the Credentials Committee will take place at 5:00 P.M., on Monday, 21 October 1957 at The Somerset in Boston, Mass. Applications to be considered at this meeting must be received in the headquarters office no later than 7 October 1957.

Applications received after this date will be held for the spring meeting of the Committee.

Annual Meeting of the Board of Governors

The Board of Governors will hold their annual meeting at 4:00 P.M., on Tuesday, 22 October 1957 at The Somerset in Boston, Mass.

A chairman is to be elected and committees will be appointed.

Twenty-Fifth Annual Banquet

The Twenty-fifth Annual Banquet of the College will be held in the Louis XIV Ballroom of The Somerset in Boston, Mass., at 7:00 P.M., on Tuesday evening, 22 October 1957. Cocktails will precede the dinner and dancing and entertainment will follow through the courtesy of The Purdue Frederick Co. of New York.

The affair will be *informal* and tickets at $10.00 per person will be available in advance. All reservations for the dinner must be made by 10:00 A.M., Tuesday, 22 October 1957.

Course in Postgraduate Gastroenterology

The Annual Course in Postgraduate Gastroenterology of the American College of Gastroenterology will be held at The Somerset in Boston, Mass., on 24, 25, 26 October 1957, with an afternoon session to be held at the Joslin Auditorium of the New England Deaconess Hospital.

The moderators of the Course, Dr. Owen H. Wangensteen of Minneapolis, Minn. and Dr. I. Snapper of Brooklyn, N. Y., will be assisted by a faculty selected from the medical schools in Boston.

Only those presenting matriculation cards indicating that they have registered and paid the fee will be admitted to the Course sessions.

Nominating Committee Report

The Nominating Committee of the American College of Gastroenterology, consisting of Dr. James T. Nix, New Orleans, La., chairman; Dr. C. Wilmer Wirts, Philadelphia, Pa.; Dr. F. H. Voss, Phoenicia, N. Y.; Dr. T. Neill Barnett, Richmond, Va. and Dr. Libby Pulsifer, Rochester, N. Y., has submitted the following slate of candidates to be voted upon at the Annual Meeting of the Fellowship of the College in October:

Officers

President-Elect	Frank J. Borrelli, M.D., New York, N. Y.
1st Vice-President	Joseph Shaiken, M.D., Milwaukee, Wisc.
2nd Vice-President	Henry Baker, M.D., Boston, Mass.
3rd Vice-President	Louis Ochs, Jr., M.D., New Orleans, La.
4th Vice-President	Edward J. Krol, M.D., Chicago, Ill.
Secretary	Theodore S. Heineken, M.D., Glen Ridge, N. J.

Board of Trustees

For 3 years:	John M. McMahon, M.D., Bessemer, Ala.
	George K. Wharton, M.D., Los Angeles, Calif.
	S. Bernard Kaplan, M.D., Newark, N. J.
	I. R. Jankelson, M.D., Boston, Mass.
	Lionel Marks, M.D., Toronto, Ont., Canada
For 1 year:	Harry Barowsky, M.D., New York, N. Y.
	Robert R. Bartunek, M.D., Cleveland, Ohio

Board of Governors

Northern California	Samuel W. Yabroff, M.D., San Francisco
Southern California	Dale W. Creek, M.D., Santa Barbara
Connecticut	Max Caplan, M.D., Meriden
Louisiana	Irving A. Levin, M.D., New Orleans
Massachusetts	Charles W. McClure, M.D., Boston
Lower New York	Joseph R. Van Dyne, M.D., Forest Hills
Ohio	Stanley S. Sidenberg, M.D., Cleveland
Pennsylvania	Julian A. Sterling, M.D., Philadelphia
Cuba	Fernando Milanes, M.D., Havana

Relax the best way
... pause for Coke

continuous quality
is quality you trust

DRINK
Coca-Cola

VISIT THE "COKE" BAR IN THE EXHIBIT AREA

ABSTRACTS FOR GASTROENTEROLOGISTS

ABSTRACT STAFF

JOSEPH R. VAN DYNE, *Chairman*

ABE ALPER
L. K. BEASLEY
ARNOLD L. BERGER
ABRAHAM BERNSTEIN
JAMES F. BISHOP
A. J. BRENNER
J. EDWARD BROWN
WALTER CANE
JOHN E. COX
CARL J. DEPRIZIO
IRVIN DEUTSCH
JOHN N. DILL
KERMIT DWORK
RALPH B. EICHHORN
I. H. EINSEL
HEINZ B. EISENSTADT
BERNARD FARFEL
BERNARD J. FICARRA
NORMAN FREUND
V. J. GALANTE
SAMUEL M. GILBERT
JULES D. GORDON
D. P. HALL
SAMUEL L. IMMERMAN
HANS J. JOSEPH
ARTHUR L. KASLOW
ERNEST LEHMAN
PAUL MATLIN
JOHN M. MCMAHON
HERMAN MILLER
ZACH R. MORGAN
LOUIS K. MORGANSTEIN
HELMUTH NATHAN
JACOB A. RIESE
LOUIS A. ROSENBLUM
GLENN S. ROST
ARNOLD STANTON
STANLEY STARK
BERNARD STERN
ANTHONY M. SUSINNO
CHESTER S. SVIGALS
PAUL B. VAN DYKE
ROBERT E. VERDON
JOSEPH E. WALTHER
REGINALD B. WEILER
ALEXANDER ZABIN

GASTROINTESTINAL TRACT

GASTROSCOPIC STUDIES IN ROSACEA: B. Usher and G. Young. Canad. M.A.J., 75:111 (15 July), 1956.

The authors contend that Rosacea is a generalized vascular disease involving many organs of the body with presenting signs on the face. On gastroscopy, in 22 patients with Rosacea, they were able to visualize changes in the mucosa from superficial to hypertrophic to atrophic gastritis. These changes were not related to digestive disturbances nor the free HCl content. During periods of remission and after therapy, the mucosa returned to normal. These findings have not been universally accepted.

A. J. BRENNER

GASTROINTESTINAL BLEEDING—ROENTGEN ASPECT: Don C. Weir. Mississippi Valley M. J., 78:174 (July), 1956.

A study is presented of 75 consecutive cases of gastrointestinal bleeding verified by operation, autopsy, or unequivocal findings on a repeat gastrointestinal series. Roentgenographically duodenal ulcer accounted for 50 per cent of gastrointestinal bleeding, gastric ulcer 17 per cent, esophageal varices 11 per cent and hiatus hernia 8 per cent. The etiological factor was undetermined in 5 per cent. The largest source of error was the superficial gastric ulcer which was easily overlooked.

Early radiological examination of the patient bleeding from the gastrointestinal tract is accurate, not dangerous, and may enable more intelligent and definitive therapy.

ARNOLD STANTON

PATHOLOGIC ASPECTS OF FATAL GASTROINTESTINAL HEMORRHAGE BASED ON AUTOPSY STUDIES: W. Stanley Hartcroft. Mississippi Valley M. J., 78:171 (July), 1956.

Peptic ulcer and esophageal varices cause 80 per cent of the lesions responsible for fatal gastrointestinal hemorrhage. Although duodenal ulcer is a more common cause of hemorrhage than gastric ulcer in clinical studies, the reverse is true in au-

topsy statistics. Esophageal varices are responsible for as high as 30 per cent of some series of fatal cases of gastrointestinal bleeding coming to autopsy. A diagnosis of cirrhosis does not mean that the source of the hemorrhage is necessarily a ruptured varix, for such patients often bleed due to gastritis or duodenal ulcer.

Other causes of fatal gastrointestinal bleeding are carcinoma of the stomach, rupture of an aortic aneurism into the gastrointestinal tract, hiatus hernia, and rupture of the esophagus. In children bleeding may be due to peptic ulceration of gastric mucosa in a Meckel's diverticulum, volvulus or intussusception.

ARNOLD STANTON

A CLINICAL AND SURGICAL CONTRIBUTION TO THE CORRECTION OF RIGHT-SIDED ABDOMINAL PAIN: B. Raymond Weston. J. Internat. Coll. Surgeons, 26:166 (Aug.), 1956.

The author calls attention to mechanical causes for right lower quadrant pain due to distortion of the cecum. This mechanical pathology is such that it disturbs and distorts the cecum producing the symptom of pain. The appendix may or may not be secondarily involved in this situation. The operative procedure is to replace the cecum into its normal position. This may necessitate the lysis of adhesions and the attachment of the cecum to a new area. The appendix is usually removed.

BERNARD J. FICARRA

SOME OBSERVATIONS CONCERNED WITH DIGESTIVE TRACT ROENTGENOLOGY—PART I: Marlyn W. Miller. Pennsylvania M. J., 59:796 (July), 1956.

This is a report of routine gastrointestinal and gallbladder x-ray examinations in general hospitals during 1953, consisting of 1,855 x-ray examinations, which the author evaluates and tabulates.

Gallbladder studies were done on 407 patients, 56 of which x-ray studies were 100 per cent accurate for gallbladder disturbance. Only 44, however, were found to have stones, of which 24 were diagnosed correctly, preoperatively, showing an accuracy of 54 per cent, because nonopaque stones were not demonstrable.

Upper gastrointestinal studies were done on 674 patients, using a thick and thin barium, fluoroscopy, films of esophagus, stomach, and duodenum with progress films at 2 and 24 hours thereafter. In this series there were 542 or 76 per cent normal and 112 duodenal ulcer, the rest being distributed among other gastrointestinal conditions.

Colon examinations were done on 710 patients with 95 per cent found to be normal, of which 118 were irritable colon, which if included in this group will bring it down to 79 per cent. Operated were 26 of which 7 were carcinoma and the rest polyps, hemorrhoids, etc. Sigmoidoscopy was done on 206 with 2 found to have carcinoma of the rectum and 26 polyps, of which 23 were proven benign and 3 malignant.

In conclusion, the authors note that of the 1,855 examinations, 1.6 per cent were carcinoma, 16 per cent duodenal ulcer, 16 per cent irritable colon. This report is an attempt to correlate symptoms with interpretation of x-rays, and the incidence of abnormalities.

LOUIS K. MORGANSTEIN

STOMACH

PLASMA PEPSINOGEN IN PEPTIC-ULCER DISEASE AND OTHER GASTRIC DISORDERS: Carl S. Hoar, Jr. and J. R. Browning. New England J. Med., 255:153 (26 July), 1956.

Pepsin, a protolytic enzyme, is considered by many to be an etiologic factor in peptic ulcer disease. Pepsinogen, its precursor, can now be evaluated by a simple blood test introduced by Mirsky in 1952 and evaluated by the authors. The present report consists of various groups.

Patients with duodenal ulcer have been

followed up to 18 months both during exacerbations and remissions with the plasma pepsinogen not varying more than the normal 10 per cent. There was also no relationship between the plasma pepsinogen level and the severity of the disease. Steroids, in therapeutic doses, had no effect on the plasma pepsinogen level in humans.

In conclusion: plasma pepsinogen can be determined by a simple blood test. Plasma pepsinogen levels in patients with peptic ulcer are considerably higher and after gastrectomy become considerably lower than in the normal. A low plasma pepsinogen in the presence of a gastric ulcer is a strong suspicion of cancer after pernicious anemia has been ruled out.

A. J. BRENNER

PRO-BANTHINE IN THE TREATMENT OF PEPTIC ULCER: Jacob Lichstein, Margaret G. Morehouse and Kent L. Osmon. Am. J. M. Sc., 232:156-171 (Aug.), 1956.

The authors have made a study of Pro-Banthine in the treatment of peptic ulcer. This has been used particularly in contrast to the use of Banthine. It was felt that the Pro-Banthine had fewer side-effects, but it was valuable only for the relief of pain of uncomplicated duodenal ulcer when used in conjunction with diet and antacids. The drug tolerance was good. It was felt that the use of Pro-Banthine, especially with first attacks, was of great value. There was nothing to indicate any reduction in recurrence, or incidence of complication on a long term basis. Pro-Banthine was also found to be of value in the acute phases of related gastrointestinal conditions where a parasympathetic effect is desirable.

BERNARD FARFEL

SALICYLATE INGESTION: A FREQUENT CAUSE OF GASTRIC HEMORRHAGE: J. J. Kelly, Jr. Am. J. M. Sc., 232:119-128 (Aug.), 1956.

The author points out the frequency of association of the ingestion of salicylates with upper gastrointestinal hemorrhage. It is pointed out that hypoprothrombinemia is not always present. It is further shown that bleeding may occur either with or without the presence of peptic ulcer. It is felt that either a local action on the stomach mucosa or an increase in the acidity leading to peptic erosion is responsible for the bleeding. The author points out that patients with proven peptic ulcer taking aspirin have an increased frequency of bleeding. The author concludes that a history of possible salicylate effect should be considered in all cases where the patient taking them has had some type of upper gastrointestinal hemorrhage.

BERNARD FARFEL

INTESTINES

DIAGNOSIS OF BOWEL OBSTRUCTION: Louis T. Palumbo and Thomas C. Glenchur. Internat. M. Digest., 69:24 (July), 1956.

Determination of site of obstruction is greatly helped by careful clinical investigation. Typical colicky pain starting and terminating abruptly occurs at very short time intervals in upper small bowel disease while the colics occur initially only once every 30 to 60 minutes in obstruction of the large bowel. Borborygmi may occur in any place of the abdomen and do not help localization much. They sound metallic or bell-like in the presence of gas distention and bubbling or gurgling if an excessive fluid fills the loops. Vomiting occurs early in high small bowel obstruction, late in that of a lower ileum and rarely in colonic obstruction. So-called fecal vomiting indicates small bowel occlusion. Vomiting of feces, however, is not associated with any form of obstruction and occurs only with gastrocolic fistula. In the presence of ileus, the rectal ampulla is dilated while it is collapsed and folds snugly around the examining finger in mechanical obstruction. Large bowel obstruction develops more slowly but once the blood supply is impaired the patient goes downhill rapidly. Marked changes of water, electrolyte and proteins occur with small bowel disease and are not seen in large bowel obstruction. Gaseous distention of both small and large bowel indicates

usually ileus but if it is found in association with colics it means large bowel obstruction. A closed loop type of obstruction may never show gas on the x-ray film. Strangulation usually occurs in the small bowel and is characterized by continuous pain, local tenderness and rebound tenderness, muscle spasm and frequently by a palpable mass. There is also usually shifting dullness of peritoneal fluid, fever, leucocytosis, a rapid pulse, silent abdomen, shock and melena.

H. B. EISENSTADT

TREATMENT OF PINWORMS (OXYURIASIS): W. Price Killingsworth and O. H. Ross. Internat. M. Digest., 69:117, 1956.

Incidence of pinworms in children varies from 10 to 95 per cent in various localities, is lowest among Negroes, highest among white school age children, especially in thumb-suckers and nail biters. Diagnosis is made by Scotch tape anal swab.

Most effective drugs at this time have been found to be Carpazine (Goodrich Wright), 1 to 4 tablets q.i.d., Terramycin 1 to 2 gm. daily, procaine coated gentian violet (Cutter Lab.), 1 to 2 tablets t.i.d. and Antepar, 1 to 3 teaspons t.i.d., dosage varies with age. All substances are given daily for 7 days and after a 7-day pause repeated for another week.

H. B. EISENSTADT

ACUTE APPENDICITIS IN THE ELDERLY PATIENT: J. D. Martin, Jr. Internat. M. Digest., 69:96, 1956.

Several factors may complicate the diagnosis and management of appendicitis in the elderly. For instance, the absence or mildness of pain, the slow insidious onset of the disease with indigestion and inappetence, the intermittency of pain and of other symptoms, the mildness of the tenderness, the absence of fever or elevation of white cell count. A case is reported of an 81-year old man where indigestion, intermittent pain and mild fever were associated with a small nonreducible right inguinal hernia. During herniorrhaphy a small amount of pus was encountered in the hernial sac gravitating down from the abdominal cavity. The incision was extended into the peritoneal cavity and a gangrenous appendix was discovered as the cause of this pus accumulation.

H. B. EISENSTADT

THE VALUE OF THE ENEMA IN DIAGNOSIS AND TREATMENT: James F. Brailsford. J. Internat. Coll. Surgeons 26:1 (July), 1956.

The negative values of the barium enema in malignant lesions of the lower bowel are emphasized. The author cites the case of an inoperable fungating carcinoma near the anus which had been repeatedly overlooked, simply because no one bothered to do a digital examination before ordering x-ray examinations.

Both the cleansing enema and the barium enema used in x-ray diagnostic procedures are discussed. He points out that all roentgen procedures are incapable of benefiting the patient unless used solely as auxiliary diagnostic aids.

JOHN E. COX

THE PARASITES OF THE SMALL INTESTINE: Roger Cattan. Internat. M. Digest. 69:137, 1956.

Lamblia Giardia infestation takes place by ingestion of cysts with drinking water or food. The symptomatology of this condition is difficult to evaluate because of the frequency of latent cases. Most frequently there is a chronic diarrhea with or without colics and soft greenish stools refractory to the usual treatment. The malabsorption syndrome may be produced by massive invasion of the parasites. Bronzed pigmentation of the skin, fatigue, myalgias, urticaria, headache, polyneuritis, keratitis, iritis and choroiditis have been attributed to the general toxicity. The only useful drug in lam-

bliasis is atebrine 0.1 gm., t.i.d., for 5 days. A second course of this treatment is permissible after a pause of 2 weeks.

Anchylostomiasis causes hypochromic anemia, eosinophilia and pseudomalarial fever. Thymol, finely pulverized and administered in 0.5 gm. tablets every ½ hour for a total of 2 to 8 gm. is the least toxic therapy, also Piperazine is used with some success. Tetrachlorethylene is reserved for the severe cases in the form of 3 to 6 hard gelatin capsules each containing 1 c.c. of the drug to be taken 5 minutes apart.

Anguilluliasis causes high and persistent eosinophilia of the peripheral blood in addition to nonspecific abdominal complaints. It is resistant to therapy but Piperazine may be tried.

Ascaris causes Loeffler's syndrome of the lungs and eosinophilic pleurisy. This may occur weeks or months before ova are discharged in the stool. Also pseudoappendicitis, pancreatitis, intestinal perforation with peritonitis and obstructive jaundice may be found. Piperazine is a preferred therapy.

The well-known hunger pains of taeniasis are associated with a duodenitis or an x-ray deformity of the bulb. Thymol, 3 tablets of 0.5 gm. each daily for 3 days, is the least toxic substance to eliminate tapeworms.

H. B. Eisenstadt

ABDOMINAL PAIN: ITS INTERPRETATION IN THE DIAGNOSIS AND MANAGEMENT OF THE ACUTE ABDOMEN: Gerald J. Menaker. Illinois M. J. 110:9 (July), 1956.

Abdominal pain can be divided into three categories: visceral, caused by an adequate stimulus to the sympathetic innervation of an abdominal viscus, referred visceral, increased stimulus to the sympathetic fibres communicated to cerebrospinal nerves and referred to an area some distance from the original stimulus, parietal pain caused by direct stimulation of the parietal peritoneum by acid, blood, pus or fecal material.

The first type is vague, deep seated, poorly localized and dull in character associated with nausea, vomiting, sweating and slow pulse and of a more or less stabbing nature.

The third is better localized, more superficial and accompanied by muscle spasm, cutaneous tenderness, decidedly stabbing in nature and aggravated by coughing, walking or handling, and often indicates that serious complications have developed.

The second because of its mode of transmission, usually manifests itself as a segmental reaction some distance from the original area of pathology.

Pneumonia, pleurisy, coronary disease may all produce abdominal pain, but it is never parietal in character.

It is of utmost importance to bear in mind the anatomic and physiologic features of the abdominal cavity in the presence of pain so as to correctly evaluate the pathologic processes as they progress.

J. Edward Brown

ILEOSTOMY: REFINEMENETS IN TECHNIC: Miguel A. Valiente. J. Internat. Coll. Surgeons 26:15 (July), 1956.

This article outlines the advantages of the pull-through procedure of the ileum through the anus, with the preservation of the intact sphincter control and a side-to-side ileoileostomy, the purpose of the latter being to establish a pouch to serve as a reservoir for the ileal contents.

This technic is intended for cases in which total colectomy is required as in cases of ulcerated colitis or multiple polyposis. By controlling the number of daily bowel movements, irritation to the perianal skin is avoided, and the loss of fluids and electrolytes are controlled by adequate absorption of these elements from the small bowel.

John E. Cox

REGIONAL ENTERITIS: PROBLEMS IN ITS MANAGEMENT: J. Arnold Bargen. Wisconsin M. J. 54:367 (Aug.), 1956.

It is apparent that the thinking of physicians about regional enteritis has changed considerably in the past 30 years. Whereas at one time the disease was thought to be

primarily surgical, surgical intervention now is limited largely to complications. Regional enteritis tends to be a relentlessly progressive intestinal inflammatory process; thus, removal of the diseased segment frequently does not accomplish the desired end. It is a condition associated with most unpleasant complications that are frequently difficult to manage. The management of this disease frequently taxes the physician's ingenuity; while some of these patients do extremely well, the disease in many others appears to march on inexorably.

It is obvious that roentgen therapy is not the last word in the treatment of regional enteritis, but it is a good second best, if not a best, from the standpoint of present-day treatment. It is to be hoped that better measures of therapy will be available in the not-too-distant future.

ARNOLD L. BERGER

THE CASE FOR VIRAL DIARRHEAL DISEASE: A. R. Higgins. Editorial, Am. J. Med., 21:157 (Aug.), 1956.

Filterable agents may be the proximate cause of several clinical syndromes which are frequently characterized by diarrhea. Among these syndromes may be included "epidemic nonbacterial gastroenteritis" of Gordon, epidemic diarrhea of the new born "stomatitis and diarrheas of infants", "acute nonbacterial gastroenteritis", "winter vomiting disease" and viral dysentery. There is, apparently, a wide spectrum of clinical disease produced by these agents including more or less fever, nausea or vomiting, headache, malaise and in most cases diarrhea or rarely dysentery. As a group, these infections appear to be mild and self-limited. The infection has been reproduced in human volunteers by inhalation or by oral inoculation. However, no successful growth of the agent has yet been possible in laboratory animals or in tissue media. The clinician is therefore justified, after proper negative search for bacterial and parasitic pathogens, in referring to these syndromes in such clinical terms as "virus gastroenteritis", "virus enteritis" or "virus diarrhea or dysentery".

JOHN M. MCMAHON

DIVERTICULITIS OF THE CECUM AND ASCENDING COLON: James F. Regan and Gerald E. Benston. West. J. Surg. 64:444 (Aug.), 1956.

A report is presented on 15 cases of patients with diverticulitis of the cecum and ascending colon, 14 of whom were operated upon. It is emphasized that diverticula often occur in the cecum and ascending colon. They are usually solitary, and they may become inflamed with a symptom-complex resembling acute appendicitis. The differential diagnosis is discussed. The location and gross appearance at operation is described. In general, surgical treatment should be directed along the same lines as for acute appendicitis. Simple excision of the diverticulum is the operation of choice, however, on occasion, the inflammation may be so extensive as to necessitate more involved procedures. The morbidity and mortality rates are increased, due to ill-judged and unnecessarily extensive surgical procedure.

JOHN E. COX

LIVER AND BILIARY TRACT

INFECTIOUS MONONUCLEOSIS HEPATITIS. A CLINICOPATHOLOGIC STUDY: Col. Robert S. Nelson and Capt. James H. Darragh. Am. J. Med. 21:26 (July), 1956.

Liver involvement has been reported by various investigators in 55-100 per cent of patients with infectious mononucleosis. In order to clarify these claims 22 young men with this disease were studied by liver function tests as well as liver biopsies. Abnormal findings were present in all cases, sometimes only the biopsy showed hepatic disease, at other times only the function tests, but most frequently both. In all but one instance the liver disturbance disappeared within 5 weeks. Only one patient developed chronic hepatitis with persisting inflammatory changes seen in a biopsy specimen

taken 8 months after the onset. Differentiation from viral hepatitis may be difficult because the pathological features of both diseases are similar and some cases of infectious mononucleosis have apparently heterophil antibodies below diagnostic levels.

H. B. EISENSTADT

CHLORPROMAZINE JAUNDICE: Morton I. Silverman. Pennsylvania M. J. 59:801 (July), 1956.

The question of thorazine jaundice should be kept in mind, if patients have been taking this drug, whether in small or large doses, as drug idiosyncrasy or drug allergy, rather than toxicity, due to high dosage, may be the cause.

The condition simulates that of viral hepatitis, with chills, fever, etc., and withdrawal of the drug clears up the symptoms. Some patients may tolerate the drug after the jaundice clears up. The explanation is not clear, but it is wiser not to re-employ it. The treatment initiated was that for viral hepatitis—restrict activity, high calorie, high protein, carbohydrate and high vitamin diet and stop the drug. The prognosis is good as jaundice clears up in a few days. Since this is an allergic phenomenon, look for eosinophilia.

In conclusion, the authors state that chlorpromazine should not be used promiscuously and without regard for its potentialities. They suggest the early use of the alkaline-phosphatase test to detect as early as possible the onset of jaundice, so that the drug may be discontinued and so forestall further difficulties.

LOUIS K. MORGANSTEIN

DELAYED VISUALIZATION OF THE GALLBLADDER DUE TO GASTRIC RETENTION: S. A. Leader. Illinois M. J. 110:26 (July), 1956.

Delayed visualization of the gallbladder, using iodine compounds, may occur in the absence of pathology in biliary tract or gallbladder.

The author cites an instance in a case of a male, age 35, hospitalized for periarteritis, who developed jaundice following a transfusion for anemia, where visualization of the gallbladder did not occur until 24 hours had elapsed postingestion of the dye, and then only following the ingestion of a fatty meal.

Gastrointestinal studies had indicated that this patient suffered from gastric retention, but no definite pathology in the intestinal tract was demonstrated.

Careful scrutiny is advised in all cases of delayed visualization for evidence of atonic gastric motility.

The dye must reach the small intestine where absorption must occur before any can be demonstrated in the bile and stored in the gallbladder.

J. EDWARD BROWN

THE MANAGEMENT OF ACUTE CHOLECYSTITIS: Charles R. Cavanagh and Edward C. Parkhurst. Ann. Surg. 144:188-190 (Aug.), 1956.

The authors report on a series of 2,128 cases admitted to the Rhode Island Hospital from 1949 to 1954.

Of this number, 578 were signed out with a diagnosis of acute cholecystitis.

In the cases treated surgically, a history of sudden upper abdominal pain, accompanied by right upper quadrant tenderness and spasm plus a pathological diagnosis of acute cholecystitis were sought. In addition, fever, leucocytosis, a palpable gallbladder, or x-ray evidence of stones or a nonfunctioning gallbladder were required.

Forty-eight patients were treated medically with four fatalities.

Two hundred ninety-nine cases were treated surgically. The vast majority of these were given several hours of preoperative preparation including appropriate intravenous fluids, the institution of nasogastric suction, and antibiotics. Most were operated on within 24 hours of admission to the hospital. There were 13 postoperative and one anesthetic deaths, an overall mortality of 4.7 per cent.

It was the conclusion of the authors that early surgical intervention for acute cholecystitis in patients under 70 years of age is a safe and effective method of terminating the disease. In general complications were

rare and the period of hospitalization short, and the mortality in the neighborhood of one per cent.

In patients over 70 years, on the other hand, it was felt that a serious risk was involved, when subject to early operative management. Complications have been frequent and the mortality rate has been nearly 20 per cent, while the mortality following elective cholecystectomy in patients over 70 years is approximately 4 per cent.

A further study in this group is being undertaken.

PAUL MATLIN

CONSTITUTIONAL NONHEMOLYTIC JAUNDICE WITH "LIPOCHROME" HEPATOSIS (DUBIN-SPRINZ DISEASE): Norman L. Brown and T. K. Shnitka. Am. J. Med. 21:292 (Aug.), 1956.

The authors report a further detailed case study with investigative findings of Dubin-Sprinz Disease. Diagnosis was verified by liver biopsy taken at time of exploratory laparotomy. The evolution of the literature on the subject is traced and a comparison with Gilbert's Disease is offered. The disorder is attributed to an error in liver metabolism. Alcoholism, present in the authors' case and intercurrent illness may act as precipitating or aggravating factors. Clinical features include persistent, low grade, nonhemolytic janudice, lassitude, upper abdominal pain and slight enlargement and tenderness of the liver. Direct reacting bilirubin is elevated and forms a major portion of the total. Bilirubinuria, abnormal serocoagulation tests, delayed bromsulphthalein excretion and failure to see the gallbladder on cholecystography may be demonstrated on occasion. The patient's good health is not impaired and the prognosis appears to be good.

A constant and diagnostic histologic finding is the presence of coarse, brown lipofuscin pigment within pericentrally placed liver cells. Histochemical reactions which permit characterization of this pigment are outlined and discussed.

JOHN M. MCMAHON

NEUROLOGIC CHANGES IN A PATIENT WITH A PORTACAVAL SHUNT AND THE RELATIONSHIP TO HEPATIC COMA: J. Mangum, D. Lamons and W. J. Friedlander. Am. J. Med. 21:306 (Aug.), 1956.

The authors report a patient with a portacaval shunt and neurologic and electroencephalographic changes simulating those of hepatic coma. The syndrome was demonstrated to be completely controlled by protein restriction and to be precipitated by adding ammonia-producing compounds to the patient's diet. The appearance of symptoms and electroencephalographic changes coincided with an elevation of serum ammonia in the systemic circulation and the disappearance of the syndrome coincided with a return of the serum ammonia to normal levels. The correlation of this case with other work done on this syndrome would seem to indicate that the neurologic syndrome accompanying liver disease is due to ammonia being shunted from the portal vein directly into the systemic circulation and that even a badly injured liver is able to metabolize ammonia if not by-passed. Patients with chronic liver disease and collateral circulation had systemic ammonia levels higher than hepatic vein ammonia levels substantiating the finding that chronically damaged livers were able to metabolize ammonia but that it freely entered the peripheral circulation through collaterals. The mode of action of ammonia on the central nervous system remains unclear.

JOHN M. MCMAHON

CHOLANGIOLITIC HEPATITIS: Charles S. Campbell. Northwest Med. 55:865 (Aug.), 1956.

The author reports a case of cholangiolitic hepatitis with death following surgery for gallstones at which time biopsies were taken of the pancreas and liver. The pancreatic biopsy was followed by peritonitis. This case emphasizes the need of considering this diagnosis in a case of painless pruritus jaundice with normal hepatocellular tests.

ABE ALPER

OPERATIVE CHOLANGIOGRAPHY TECHNIC: Thomas Taylor White. Northwest Med. 55:867 (Aug.), 1956.

The author describes in detal the technic of this important procedure. He points out the pitfalls leading to errors in diagnosis and stresses the importance of this diagnostic aid to the surgeon in the management of biliary tract disease.

ABE ALPER

PANCREAS

CYSTIC FIBROSIS OF THE PANCREAS: Paul A. Di Sant'Agnese. Am. J. Med. 21:407, 1956.

The fully developed clinical picture of cystic fibrosis consists of pancreatic insufficiency with steatorrhea, azotorrhea and malnutrition associated with obstructive pulmonary emphysema and atelectasis as well as bronchial and pulmonary infection.

Less known is the occurrence of localized hepatic fibrosis and biliary obstruction resulting from inspissated biliary secretions. Widespread involvement of the liver leads to multilobular biliary cirrhosis with splenomegaly, hypersplenism, portal hypertension, gastrointestinal bleeding and ascites.

Only a minority of cases show an involvement of all exocrine glands at the same time. Some have only chronic progressive lung disease, others show pancreatic insufficiency resembling celiac disease. Isolated cirrhosis in babies or young children may be observed requiring differentiation from other types of chronic liver disease. Treatment of digestive dysfunctions consists of a high caloric, high protein, low fat diet with some restriction of starches but liberal intake of simple sugars and liposoluble vitamins. Pancreatic extracts are also useful as are liberal amounts of salt. Surgery may be required for meconium ileus as well as for the complications of portal hypertension.

H. B. EISENSTADT

A CLINICAL AND EXPERIMENTAL STUDY ON THE MANAGEMENT OF PORTAL VEIN DURING PANCREATICODUODENECTOMY: Seiko Kikuchi. Tohoku J. Exper. Med. 64:121 (25 Aug.), 1956.

In cases of carcinoma of the head of the pancreas and of the bile ducts, carcinomatous infiltration frequently etxends to the portal vein preventing radical operation without operation on the portal system. Therefore several experiments were set up in dogs to determine the best method of resection and reanastomosis of the portal vein. It was found that 70 per cent alcohol preserved the artery, 70 per cent alcohol preserved the vein, and fresh autogenous vein grafts all became occluded and that the dogs all died in shock. However when 70 per cent alcohol preserved veins were tied over polyethylene tubing, fresh autogenous vein with temporary occlusion of the superior mesenteric artery, or simple reanastomosis of the portal vein was performed, there was a 65 per cent survival. In most of these survived animals, the graft did not remain patent but gradually fibrosed. The gradual occlusion allowed time for collateral circulation to occur permitting survival of the animal. The most important factor was temporary occlusion of the superior mesenteric artery during the anastomosis. This seemed to prevent fatal shock from occurring in the animals. Reanastomosis of the portal vein was the safest procedure if it could be performed without tension. All these animals survived.

STANLEY STARK

A CLINICAL AND EXPERIMENTAL STUDY ON THE MANAGEMENT OF PORTAL VEIN DURING PANCREATICODUODENECTOMY: II: Seiko Kikuchi. Tohoku J. Exper. Med. 64:137 (25 Aug.), 1956.

This paper concerns a study of the collateral circulation formed after occlusion of the portal vein. This is established within one to two weeks after obstruction of the

portal vein. The most important are apparently a net of small veins in the mesocolon and retroperitoneum entering the inferior vena cava, a net of small veins in the mesocolon and retroperitoneum entering the right spermatic vein which drained into the renal vein and these same nets of small veins draining directly into the right renal vein. No significant esophageal varices were noted probably due to the fact that the veins leading to the esophageal veins were cut at operation. The remaining important collateral systems are superior mesenteric vein to the inferior pancreaticoduodenal vein to the superior pancreaticoduodenal vein to the hepatic side of the portal vein; superior mesenteric vein to the superior pancreaticoduodenal vein and small veins around the occlusion to the portal vein on the hepatic side; the gastrosplenic vein and coronary veins to the major pancreatic vein to the pyloric vein to the portal vein on the hepatic side; coronary vein to the small omental veins to the portal vein (hepatic side); mesenteric and intestinal veins to the veins of the large omentum to the gastrosplenic vein to the portal vein; gastrosplenic vein to the coronary veins to the esophageal veins; veins of lesser omental sac and pancreatic tail to the middle suprarenal vein or the renal vein; superior and inferior mesenteric veins to a net in the mesocolon to the spermatic vein to the renal veins; gastrosplenic vein to the splenic vein to the veins of the mesocolon to the inferior mesenteric veins; superior to the middle hemorrhoidal veins to the inferior mesenteric vein; net of small veins in mesocolon of the sigmoid colon to small veins in the retroperitoneum to the ascending lumbalis vein; small veins of the greater omentum when adherent to the abdominal wall and the veins of the abdominal wall.

STANLEY STARK

A CLINICAL AND EXPERIMENTAL STUDY ON THE MANAGEMENT OF PORTAL VEIN DURING PANCREATICODUODENECTOMY: III: Seiko Kikuchi. Tohoku J. Exper. Med. 64:143 (25 Aug.), 1956.

This article, the 3rd of the series, describes the clinical effects of portal occlusion by tumor and the difficulty of handling this complication at operation. Of 31 cases requiring pancreaticoduodenectomy, 27 showed adhesions and carcinomatous infiltration of the portal vein. When this complication occurs, it is best to start surgery from the pancreatic side rather than from the duodenum to prevent damage to the blood vessels. No over all successful method of handling occlusion of the portal vein has been found applicable in all cases and methods may have to be devised at the time of operation. In one case transplantation of a polyethylene tube inserted and tied over the edges with 70 per cent alcohol preserved vein homografts by nonsuture technic, remained patent although the patient died 27 hours postoperatively due to other complications.

STANLEY STARK

PATHOLOGY AND LABORATORY RESEARCH

STUDIES ON THE SPECIFIC ANTIGENS OF HUMAN GASTRIC CANCER, III: Katsutaro Kobayaski and Hiroja Kawasaki. Tohoku J. Exper. Med. 63:203 (25 Feb.), 1956.

Further studies by the authors to isolate the specific antigens of human gastric cancer were performed by the following methods: 1. Producing antisera in rabbits by injection of saline extracts of human gastric cancer, normal gastric mucosa, and placenta; 2. preparing antigens for tests from highly purified fractions of saline and aqueous extracts of the above three kinds of tissue; 3. performing reciprocal precipitin tests aided by reciprocal absorption tests.

The authors, using precipitin tests, found that nucleic acid, carbohydrate, and glucidamin as antigen reveal that the reaction of each fraction of human gastric cancer with an antiserum was always different from the reaction of the corresponding fraction of normal gastric mucosa, and especially in the case of nucleic acid fraction, human gastric cancer showed the most

remarkable specific antigenicity and a remarkably close relationship with human placenta. They further found by fractionation that nucleic acid preparation seems to have mainly consisted of ribonucleic acid, which is an interesting thing in view of the fact that ribonucleic acid is closely related with cellular protein metabolism. They state that the nucleic acid fraction of human gastric cancer presented the highest antigenic specificity, the glucidamin fraction a moderate, and the carbohydrate fraction least specificity.

Anyone interested in this immunogenic phase of cancer research of specific antigens of human cancer will be well repaid by reading the three original papers, especially those who feel that cancer is an infectious disease, for the cure of cancer may come through fundamental research of this nature.

I. H. EINSEL

A MACROSCOPIC AND MICROSCOPIC STUDY OF NINE CASES OF HEMORRHAGIC ULCERATIVE COLITIS: C. Richir, F. Chanoine, J. J. Bernier and A. Lambling. La Semaine des Hopitaux de Paris 17: (20 March), 1956.

A study of 9 colons from subjects affected with severe ulcerative colitis has shown that there is almost constantly a total involvement of the colic framework from rectum to cecum. The terminal ileum takes part in this extensive development in about half of the cases.

The alterations in the mucosa and submucosa are essentially vascular in nature and leading to the production of pseudopolypi which are either true inflammatory granulomas or areas of the mucosa unaffected by atrophic evolution and therefore projecting above the abdominal wall level. The submucosa and muscularis mucosae are frequently affected, so that the disease develops into true pancolitis.

The liver may present alterations due to hepatitis necrosans. The presence of pancolitis is always associated with the severe forms of hemorrhagic rectocolitis.

GUY ALBOT

EXPERIMENTAL VESICULAR DYSPLASIA: G. Albot and G. Bonnet. Arch. mal. de l'app. dig. 45:485 (May), 1956.

The presence in the gallbladder of steroid substances in the form of pellets of estradiol dipropionate and monobenzoate, of testosterone propionate and of desoxycorticosterone induces in the female guinea-pig a mucus hypertrophy and an adenofibromyomatosis of the gallbladder, lesions which may be compared with dysplasia of the gallbladder in humans (proliferative cholecystitis, Rokitansky-Aschoff sinus, adenofibromyomatosis of the gallbladder).

The effect of hormonal saturation of the bile in the gallbladder on the development of the tissues of the gallbladder throws light on certain circumstances, mysterious until now, in the etiology of disorders of the gallbladder. The mode of action of this overloading of the bile by the different hormones is worthy of close study.

MICROANGIOGRAPHY OF THE LIVER AND SPLEEN: J. Chenderovitch and J. Caroli. Revue Internat. d'Hepatologie 6:907-977 (July), 1956.

With the microangiographic technic, the authors investigate the normal and pathological vascularization, in man and animal, of the liver and spleen.

In normal livers they study the repartition and distribution of the three vessels: portal vein, hepatic artery and hepatic vein. The sinusoid capillaries receive their blood supply directly through the last branching of the portal vein and the hepatic artery; there are no anastomoses between the trunks of the two vessels.

In nodular cirrhosis, they show the existence of a perinodular, intraserous angioma recognizing a double system of shunts: portohepatic shunts on one side,

arterioportal shunts on the other side. In these cases, portal hypertension is not due to an intrahepatic block, but to the supply under high pressure of arterial blood into the hepatiportal circulation, the liver, because of sclerosis, being unable to control it despite the portohepatic shunts.

In secondary cancers of the liver, the metastatic nodules are vascularized by the hepatic artery, whereas the nodules of the primary cancers receive their blood from the portal vein.

In cholostatis cirrhosis with portal hypertension, there is a peculiar system of arterioportal shunts located in the pericholangitic sclerosis.

In acute atrophy of the liver, there is, in some cases, a circulatory exclusion of the hepatic parenchyma following the collapse of the sinusoid capillaries.

The study of the intrasplenic circulation shows that the circulatory pattern of the cirrhotic spleen is identical to that of the normal spleen; in the spleen of patients with hemolytic jaundice there is a significant decrease in the arterial volume with slender and delicate branches; on the contrary, in the hemopoietic spleen there is a considerable increase in the arterial circulation of the splenic parenchyma.

GUY ALBOT

EFFECT OF CIGARETTE SMOKING ON GASTRIC SECRETIONS OF PATIENTS WITH DUODENAL ULCER: Philip Cooper and James B. Knight, Jr. New England J. Med., 255:17 (5 July), 1956.

One hundred twenty patients with duodenal ulcer were examined in order to determine the effect of smoking on the acid and pepsin production during smoking. Half of the patients smoked at the time of the test while the other half refrained from this and served as controls. Comparison between both groups revealed no significant differences between the volume, the pH, the free acid, and peptic concentration and the peptic output. In another study the pH of the gastric juice was determined in 27 patients under basal conditions as well as after smoking and stimulation with broth and insulin, eleven of these had had partial gastrectomy for duodenal ulcer and 16 were being prepared for the same operation. It was found that smoking elevated the pH equally in both groups so that it was equally unfavorable before and after gastric resection.

H. B. EISENSTADT

ABO BLOOD GROUPS AND SECRETOR CHARACTER IN DUODENAL ULCER: C. A. Clarke, J. Wyn Edwards, D. R. W. Haddock, A. W. Howel-Evans, R. B. McConnell and P. M. Sheppard. Brit. M. J. 4995:725 (29 Sept.), 1956.

It has been shown that there is a considerable increase in blood group O in patients with duodenal ulcer as compared to controls.

The authors have some data which indirectly suggests that there are more group O mothers of children who suffer from duodenal ulcer. They do not have enough data to actually prove any such relationship, and state that more work must be carried out to discover if there is any support either for stratification or for a maternal effect.

In Part II of this paper the authors discuss secretor character in duodenal ulcer. Some people secrete their ABO blood group antigens in their body fluids, e.g. saliva. Blood group O does not secrete A or B, but H substance, which is nonspecific, being also secreted by other groups. The secretor substance contains mucus, and it is thought this mechanism in saliva and gastric juice might offer a greater protection against ulcer disease than is the case in nonsecretors. This investigation shows that there is a significantly higher proportion of nonsecretors in the duodenal ulcer patients than in the controls. Their data suggests that nonsecretor individuals may be almost 45 per cent more likely to develop duodenal ulcer than are secretors; this relationship may also hold within families.

SAMUEL L. IMMERMAN

BOOK REVIEWS FOR GASTROENTEROLOGISTS

1955-56 YEAR BOOK OF PATHOLOGY AND CLINICAL PATHOLOGY: Edited by William B. Wartman, B.S., M.D., Morrison Professor of Pathology, Northwestern University, Director of Laboratories, Passavant Memorial Hospital, etc., etc., 480 pages, illustrated. Year Book Publishers, Inc., Chicago, Ill., 1955-56. Price $6.50.

This edition of pathology has a special article, rather humorous, but true. It is written by J. Willis Hurst and found on page 8. The reviewer urges that it be read by all those who lecture or speak at conferences or panel sessions.

As in former years, abstracts are taken from various clinical and specialty journals and sent to the editor who classified them in relation to subjects. From these, the most important and most recent material is selected for inclusion in the text.

All physicians will benefit from reading Pathology and Clinical Pathology.

FLUID BALANCE HANDBOOK FOR PRACTITIONERS: William D. Snively, Jr., M.D., Member, American Academy of General Practice, Attending Physician, Evansville Child Health Clinics, Staff Member, St. Mary's Hospital, Medical Department, Mead Johnson & Co., and Michael J. Sweeney, M.D., Member, American Academy of Pediatrics, Attending Physician, Evansville Child Health Clinics, Staff Member, St. Mary's Hospital, Medical Department, Mead Johnson & Co. Illustrated by Kathleen Calhoun. 326 pages. Charles C. Thomas, Publishers, Springfield, Ill., 1956. Price $6.75.

This well written and illustrated monograph by Drs. Snively, Jr. and Sweeney dealing with "Fluid Balance", explains the electrolyte balance of the human body. Unfortunately, the busy practitioner has little, or no inclination, to read through the mass of computations and case histories.

The reviewer suggests that the Department of Pathology or Department of Biochemistry in each hospital should advise and cooperate with the staff in the administration of the electrolytes when indicated.

The authors and publisher deserve special commendation for their collaboration in publishing this volume.

INTRAVENOSE CHOLANGIOGRAPHIE—GRUNDLAGEN, TECHNIK, ERGEBNISSE: Priv. Doz. Dr. Th. Hornykiewytsch. 159 pages, 110 illustrations. Georg Thieme Verlag, Stuttgart, Germany, 1956. Price $12.85.

A well written, printed and illustrated monograph dealing with various phases of cholangiography. This text is timely, as it explains the method of visualizing the biliary apparatus including the common duct. It is especially useful in determining the cause of postoperative attacks of pain caused by spasm or the pressure of stones in the common duct.

Translated into several languages, "Intravenous Cholangiography" would be a valuable addition to roentgenologic literature.

OBSERVATIONS ON KREBIOZEN IN THE MANAGEMENT OF CANCER: A. C. Ivy, Ph.D., M.D., John F. Pick, M.D. and W. F. P. Phillips, M.D. 88 pages, tables and illustrations. Henry Regnery Co., Chicago, Ill., 1956. Price $2.50.

Physicians and the laity are urged to read "Observations on Krebiozen in the Management of Cancer". Whether or not physicians believe in this solution, it will do no harm to use it in hopeless cases. The procedure is simple, the contents of one ampule, containing 0.01 mg. krebiozen powder in solution, is injected intramuscularly, the same dose being repeated three days later and then 0.01 mg. weekly (p. 11), for several weeks or months. According to Ivy and his co-workers, notable improvement occurred in a primary adenoma of the breast in 96 hours and a measurable decrease in the size of the primary tumor or metastatic nodule within three weeks.

ROENTGENOLOGICAL DIFFERENTIAL DIAGNOSIS OF GASTRIC ULCERATIONS. (DIAGNOSTIQUE DIFFERENTIEL RADIOLOGIQUE DES ULCERATIONS GASTRIQUES): Georges Candardjis. Introductions by Dr. P. Porcher and Dr. L. Babaiantz. 188 pages with 92 illustrations. Masson & Co., Paris, 1956. Price 1,500 Fr.

The eternal problem of the differential diagnosis between cancer and gastric ulcer is seriously studied in Candardjis' publication. His book is based upon the findings on patients from the surgical service of the University of Lausanne in Switzerland. It deals with 108 benign ulcers, 16 cases of carcinomatous degenerated ulcers and 9 cases of cancers in ulcer form. Candardjis is the roentgenologist and he shows the roentgenological aspects of these lesions in conjunction with the publication of the medical, surgical and pathological findings. In his introduction, Porcher writes that our daily worries in this field are great and we are still too often embarrassed to find the correct answer only at the operation. We called it the eternal question, and we think, that due to this excellent book and many similar ones, we are going to be able to recognize many lesions which we see, and that, probably, entirely new methods have to be devised to detect all of the beginning cancers of the stomach. Too many cases, roentgenologically, cannot be differentiated from benign ulcerations; too many cancers come to operation too late. The re-examination, after therapy, is of the greatest value, but, unfortunately, the physicians and patients alike, have not understood the importance of this procedure. Porcher wants to get a positive diagnosis from the roentgenological examination, not a descriptive report, but this cannot always be done.

We like this book very much and want to recommend it to internists, surgeons and roentgenologists. It is written in French, its illustrations are very good and instructive. The print is clear. A large index of the international literature is added, which makes the book more valuable. Masson and Co. has published it with the greatest care.

INTERNAL SECRETIONS OF THE PANCREAS: G. E. W. Wolstenholme, O.B.E., M.A., M.B., B.Ch. and Cecelia M. O'Connor, B.Sc., Editors for the Ciba Foundation. 292 pages, 100 illustrations. Little, Brown & Co., Boston, Mass., 1956. Price $7.00.

Research workers from various countries are participants in these coloquia. This is the 9th volume of the series. Among the leading researchers are Best, Behrens, von Holt and others, too numerous to mention. It is very scientific and deals with deep research in the realm of the pancreas and its secretions, especially insulin.

Specialists in internal medicine, especially those treating diabetes, will find new and useful information that may be applied in their treatment of patients.

AGEING IN TRANSIENT TISSUES: G. E. W. Wolstenholme, O.B.E., M.A., M.B., B.Ch. and Elaine C. P. Miller, A.H.W.C., A.R.I.C., Editors for the Ciba Foundation. 263 pages, 96 illustrations. Little, Brown & Co., Boston, Mass., 1956. Price $6.75.

This symposium on "Ageing in Transient Tissues", is interesting reading and enlightens the physician as to the changes occurring in our bodies as the years advance.

On page 188 the reviewer came across an interesting item on the ageing of the apocrine sweat glands in the human female. Axillary glands are inactive in children, become functional at puberty and remain active throughout the sexual life. In old age, axillary odor seems to disappear. In women, the glands are believed to undergo periods of greater or lesser activity correlated with the menstrual cycle and with pregnancy. Klaar and some others do not subscribe to changes occurring during menstruation or pregnancy.

The physical instability of human red blood cells and its possible importance in their senescence also make interesting reading. All in all, the reader of this book will find many fascinating facts, which to many, are unfamiliar.

VERHANDLUNGEN DER DEUTSCHEN GESELLSCHAFT FUR VERDAUUNGS UND STOFFWECHSELKRANKHEITEN—XVIII TAGUNG IN BAD HOMBURG, 3-5 October 1955: Prof. Dr. H. W. Bansi, Hamburg, Germany. 300 pages, illustrated. Georg Thieme Verlag, Stuttgart, Germany, 1956. Price $11.40.

The transactions of the 18th Congress of the German Society of Gastroenterology and Nutrition are included in this treatise. The topics discussed were peptic ulcer, portal hypertension, allergy in gastrointestinal conditions, obesity and other less important subjects.

Many new diagnostic and therapeutic suggestions make these transactions worthwhile reading.

THE MERCK MANUAL—Ninth Edition: Editorial Board—Charles E. Lyght, M.D., Editor, William P. Bager, M.D., George A. Carden, M.D., Augustus Gibson, M.D. and Dickinson W. Richards, M.D. 1,870 pages, illustrated, extensive cross index. Merck & Co., Inc., Rahway, N. J., 1956. Price $6.75.

If I were asked which of the many books on medicine I would like to use for quick references, my answer would be "The Merck Manual". Between its covers the physician will find valuable suggestions, diets and prescriptions.

Medical students will also find the manual a valuable asset when preparing for a quiz or written examination. It is highly recommended.

NEW AMBULATORY TREATMENT

hastens healing of

Gastric and Duodenal Ulcers

Roentgenological healing of ulcer in 81% cases, relief of pain without analgesics in 92%, weight gains averaging 7.9 lbs. in 93%. Occult blood disappears from stools. No side effects, no after effects, no acid rebound.

This new therapy introduced from Holland (Pharmaceutische Fabriek Roter) is now available in the United States as Romach tablets, which contain finely particulated bismuth subnitrate (Romach process) combined with standard antacids.

Romach forms a protective coating of the ulcer bed, quickly relieving pain and also promoting rapid roentgenological healing.

Average dose, 2 tablets t.i.d., p.c. Available in boxes of 60, 150 and 660.

ROMACH

Write for Professional sample and literature.

ROR CHEMICAL CO. AJG—9
2268 First Ave., New York 35, N. Y

Please send me without obligation professional sample, and literature on Romach tablets.

..... M.D.

..... Street

City ..... Zone ..... State .....

SEE OUR EXHIBIT AT BOOTH 9

Resion acts instantly in the intestinal tract

by the unique electrochemical adsorptive action (anion exchange) of its resin component.[1] Insoluble and nontoxic[2], Resion removes noxious substances through electrochemical attraction—like a magnet. This action occurs instantaneously . . . as quickly as Resion and toxic acid molecules are within functioning range of chemical forces[1], —yet it leaves important amino acids, vitamins and minerals unaffected. With Resion, 86 of 90 patients had complete relief of diarrhea in 8 to 12 hours.[3]

For simple diarrhea: Resion, a combination of polyamine methylene resin and synthetic silicates.

For infectious diarrhea: Resion P-M-S, the Resion formula plus polymyxin, phthalysulfacetamide and the parabens.

References: 1. Martin, G. J.: Ion-Exchange and Adsorptive Agents in Medicine, Little, Brown and Co., Boston, 1955, P. 205. 2. Lichtman, A. L.: Exper. Med. & Surg. 9:90, 1951. 3. Gabroy, H. K., and Selsman, G. J. V.: Amer. J. Digest. Dis. *20*:395, 1953.

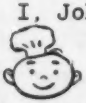
Products of Original Research

THE NATIONAL DRUG COMPANY
Philadelphia 44, Pa.

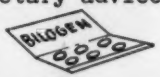
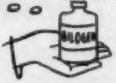
R-2712/57

SEE OUR EXHIBIT AT BOOTH 5

Dear Doctor:

I, John Droe, was a bachelor I did my own cooking  and ate only those things which pleased me most.

One evening, I stopped at the butcher shop and bought four pork chops. 'Twas a veritable feast. But soon after I finished eating, the feast began to trouble me and trouble me and trouble me a common occurrence.

I hied myself to Dr. Jones who reached into his experience for some sound dietary advice and into his drawer for some Bilogen samples he had  "Take two of these now with water for relief and here's a prescription for some to keep on hand  in case you have this trouble again. But don't overload your digestive tract as you have been, and stay away from so many rich foods. Moderation in diet is what you need."

The Bilogen worked so well that I felt better before I got home I took Dr. Jones' advice and stayed away from rich foods as much as possible. But whenever I had some trouble, I found that Bilogen gave me the help I needed. In fact, I felt so much better that I even got married.

John Droe

P. S. Why don't you write to Organon Inc., Orange, N. J., for a trial supply of Bilogen for one of your patients?

not as simple as "APC"...

The search for an analgesic preparation superior to APC has culminated in the development of FALGOS TABLETS. After extensive pharmacological research, alkaline substances – which speed absorption[1] and minimize the side effects of acetylsalicylic acid[2] – have at last been successfully combined with APC in a stable, pharmaceutically elegant tablet.

Faster pain relief . . . better gastric tolerance

The distinct advantages of Falgos were recently demonstrated in a controlled study[3] of hospitalized patients. In 1528 of 1694 administrations (90.2%), complete relief was provided within 10 to 30 minutes without side effects. Some degree of relief for aches and pains in a variety of mild to severe somatic conditions was experienced by 98.9% of all patients studied.

In another series of studies in which buffered and unbuffered APC tablets were compared, the buffered material was shown to be definitely superior to the unbuffered tablets from the standpoint of faster, more effective pain relief and better gastric tolerance.

Each Falgos Tablet contains: aspirin 3 gr; acetophenetidin 2 gr; caffeine ½ gr; and a balanced proportion of aluminum and magnesium hydroxide.

Indications: Pain of headaches, neuralgias, neuritis, muscular aches and pains, discomfort of the common cold; minor aches and pains of rheumatism and arthritis; before and after dental procedures and tooth extractions.

Dosage: 1 or 2 tablets with water, repeated every three hours if necessary.

Supplied: Bottles of 15 and 40 tablets.

FALGOS®

ANALGESIC-ANTACID TABLETS

1. Lolli, G., and Smith, R.: New England J. Med. 235:80 (July 18) 1946.
2. Schnedorf, J. G.; Bradley, W. B., and Ivy, A. C.: Am. J. Digest. Dis. 3:239 (June) 1936.
3. In press.

For samples, write: AMERICAN FERMENT CO., INC., New York 18, N. Y.

VISIT THE EXHIBITS

capillary bleeding in duodenal ulcer

C.V.P. as adjunct therapy in

hemorrhagic duodenal ulcer and ulcerative colitis

As faulty capillary function may be a causative or contributing factor in hemorrhage of duodenal ulcer and ulcerative colitis, Weiss et al.[1] administered C.V.P. to help reduce excessive capillary permeability and fragility. Bleeding duodenal ulcer "responded in the most satisfactory manner." A "salutary effect" was obtained in most cases of hemorrhagic ulcerative colitis.

CVP®

Each C.V.P. capsule or each 5 cc. of syrup (approx. 1 teaspoonful) provides:

Citrus Bioflavonoid Compound	100 mg.
Ascorbic Acid (vitamin C)	100 mg.

water-soluble, and so is better absorbed than relatively insoluble purified hesperidin or rutin. C.V.P. contains not one but many naturally occurring biologically active water-soluble factors of the bioflavonoid complex.

1. Weiss, S. et al.: Amer. J. Gastroenterol. 24:523, Nov. 1955.

SAMPLES and literature on request.

u. s. vitamin corporation • pharmaceuticals
(Arlington-Funk Laboratories, division)
250 East 43rd Street, New York 17, N. Y.

THE UNLADYLIKE BEHAVIOR OF MARIA MITCHELL

In a quiet house in Lynn, Massachusetts, in 1889, an old woman lay waiting for death. "Well," she said in amused wonder, "if this is dying, there is nothing very unpleasant about it." And the book closed for one of the most remarkable of the many remarkable women America has produced.

Her story began on a night very long ago when, as a Quaker girl in Nantucket, Maria Mitchell discovered a comet—and got a gold medal worth 20 ducats from the Danish King.

Overnight she became a celebrity. But many people, wedded to the popular notion of woman as a "household ornament," regarded Maria as an unwelcome phenomenon and her discovery as only an accident.

That was because they didn't know Maria Mitchell. At 12 she could regulate a ship's chronometer; at 17 she understood Bowditch's "Practical Navigator" and was studying science in self-taught French, German and Latin. In time she would become the first woman member of the American Academy of Arts and Sciences, the first woman astronomy professor —in Matthew Vassar's Female College—and a member forever of New York University's Hall of Fame.

Moreover, all her adult life she was to work with growing success in the crusade to make American women free.

No one these days would question the rewards of Maria Mitchell's crusade. Women today enrich every level of public life. And, in family life, they guard financial security two times out of three. One reason, probably, why their families have more than $40,000,000,000 saved—in guaranteed-safe United States Savings Bonds.

Women know there is no *safer* way to save. Trust them. Through Payroll Savings or at your bank, start *your* Bond program, too. Today.

Now Savings Bonds are better than ever! Every Series E Bond purchased since February 1, 1957, pays 3¼% interest when held to maturity. It earns higher interest in the early years than ever before, and matures in only 8 years and 11 months. Hold your *old* E Bonds, too. They earn more as they get older.

PART OF EVERY AMERICAN'S SAVINGS BELONGS IN U.S. SAVINGS BONDS

The U. S. Government does not pay for this advertisement. It is donated by this publication in cooperation with the Advertising Council and the Magazine Publishers of America.

VISIT THE EXHIBITS

in frequency of incidence . . .
"The symptom complex of nausea and vomiting is second only to pain as a clinical manifestation of disease."[1]

BONAMINE*

BRAND OF MECLIZINE HYDROCHLORIDE

provides long-lasting control of the nausea, vomiting, and vertigo:

IN DRUG-INDUCED EMESIS Bonamine depresses vestibular sensitivity, accounting in part for its "effectiveness in alleviating opiate-induced vomiting . . . [and] in combating vestibular vertigo and the toxic vestibular effects of streptomycin."[1]

IN EMESIS SECONDARY TO INFECTIONS AND TOXICOSES Bonamine is "successful in controlling the vomiting associated with common pediatric infections and toxicoses."[1] Side effects such as drowsiness are "infrequent."[1]

IN POSTOPERATIVE VOMITING "Bonamine is a suppressor of postoperative nausea and vomiting, and has a potential use in contributing to the . . . clinical well-being of patients recovering from surgery requiring general anesthesia."[2]

IN VERTIGO DUE TO CEREBRAL ARTERIOSCLEROSIS Bonamine affords a high degree of relief of vertigo in patients with cerebral manifestations. "The lack of adverse effects . . . suggests that long-term use of this drug . . . is a reasonable procedure in the management of such patients."[3]

IN MOTION SICKNESS In any kind of travel, Bonamine is the only motion-sickness preventive effective in a single daily dose; notably safe and free of side effects.[4]

Bonamine is also valuable in treating the dizziness and emesis associated with radiation therapy, Ménière's syndrome, fenestration procedures, and labyrinthitis.

Available as scored, tasteless tablets, 25 mg.; and as mint-flavored chewing tablets, 25 mg.

1. Conner, P. K., Jr., and Moyer, J. H.: GP *14*:124 (Nov.) 1956.
2. Kinney, J. J.: J. M. Soc. New Jersey *53*:128 (March) 1956.
3. Weil, L. L.: Florida J. Gen. Pract. *4*:9 (July) 1954.
4. Report of Study by Army, Navy, Air Force Motion Sickness Team: J.A.M.A. *160*:755 (March 3) 1956.

*Trademark

PFIZER LABORATORIES, *Division, Chas. Pfizer & Co., Inc.*, Brooklyn 6, N. Y. Pfizer

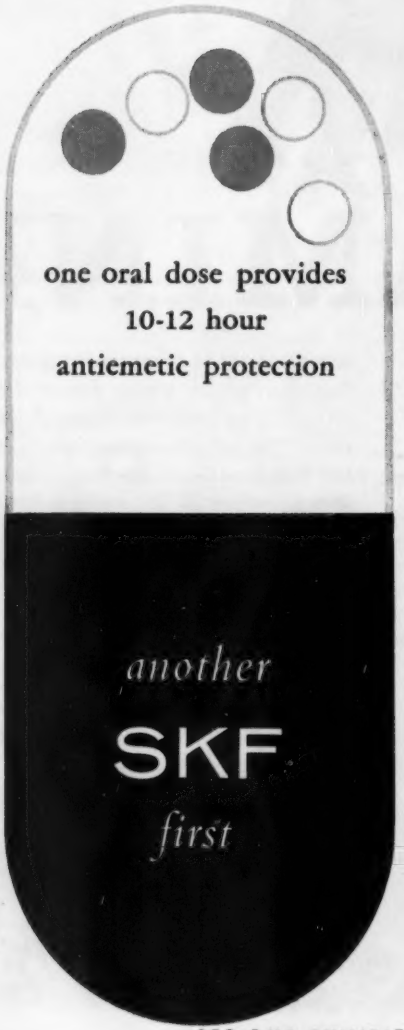
VISIT OUR EXHIBIT AT BOOTH 26

NEW

*Compazine** *Spansule*†

capsules

combine the advantages of the superior antiemetic and the unique sustained release dosage form



for prompt and prolonged control of the nausea and vomiting caused by:

pregnancy
viral gastroenteritis
terminal cancer
duodenal ulcer
postoperative conditions
radiation therapy
nitrogen mustards
migraine headaches
tension headaches
meningeal inflammation
psychogenic factors

Available: 10 mg. and 15 mg.
'Compazine' *Spansule* capsules

Smith, Kline & French Laboratories, Philadelphia

*T.M. Reg. U.S. Pat. Off. for prochlorperazine, S.K.F.

†T.M. Reg. U.S. Pat. Off. for sustained release capsules, S.K.F.

Patent Applied For.

SEE OUR EXHIBIT AT BOOTH 24

PICK THE PIPERIDOL BEST FOR YOUR PATIENT

for pain⇄spasm of the upper G.I. tract

capsule
DACTIL®
Brand of Piperidolate HCl

visceral eutonic
relieves gastroduodenal and biliary pain⇄spasm —usually in 10 minutes

for peptic ulcer

tablet
PIPTAL®
Brand of Pipenzolate Methylbromide

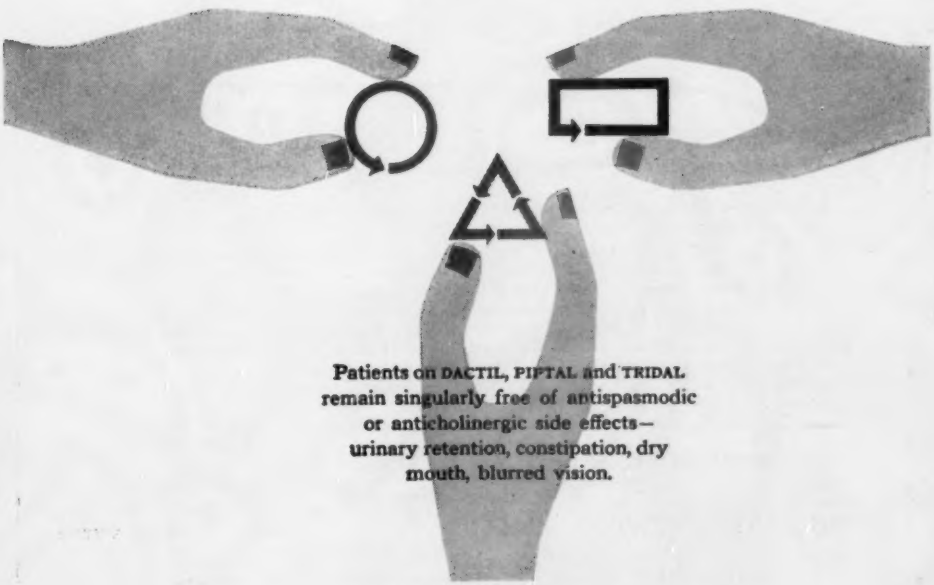
cholinolytic
normalizes motility *and* secretion; prolongs remissions, curbs recurrences

for generalized G.I. disorders

tablet
TRIDAL®
(DACTIL+PIPTAL—in one tablet)

rapid, prolonged relief *throughout the G.I. tract*

LAKESIDE



Patients on DACTIL, PIPTAL and TRIDAL remain singularly free of antispasmodic or anticholinergic side effects— urinary retention, constipation, dry mouth, blurred vision.

VISIT THE EXHIBITS

SEE OUR EXHIBIT AT BOOTH 24

FOR ANTI-FLATULENT EFFECTS IN INTESTINAL FERMENTATION AND GASTRO-INTESTINAL DYSFUNCTION

NUCARPON

Reg. U. S. Pat. Off.

HIGHLY ACTIVATED CHARCOAL COMPOUND TABLETS

Each tablet contains: Extract of Rhubarb, Senna, Precipitated Sulfur, Peppermint Oil and Fennel Oil, in an activated, willow charcoal base.

- A Rational Adsorbent
- A Gentle Laxative
- Encourages Perislalsis
- A Resorptive Modifying Action
- Renders Bacteria, Toxins and Gases Innocuous

Manufacturers of **VALERIANETS-DISPERT,** a natural herbaceous sedative, indicated in cases of Nervous Excitement, Depression, Cardiac, and Gastrointestinal Neurosis. Not habit forming. Odorless and Tasteless.

NUCARPON avoids the use of drastic cathartics, and of oils which deprive the system of fat-soluble vitamins.

It is a mild laxative, adsorbent and carminative. Indicated in Hyperacidity, Indigestion, Flatulence and Gastrodynia.

IN BOTTLES OF 100 TABLETS

Sample and Literature on request.
Available at all prescription pharmacies.

STANDARD PHARMACEUTICAL CO. INC.

253 WEST 26 STREET, NEW YORK 1, N. Y.

EDER-PALMER TRANS-ESOPHAGOSCOPIC FLEXIBLE GASTROSCOPE

Requested by the profession!

Introducing the new Trans-Esophagoscopic Gastroscope and its outstanding features:

1. Designed to fit through our standard 45 or 53 cm by 9.5 mm instruments
2. Smaller in diameter — 9¾ mm but *standard size* lenses — same clarity and brilliant image as known in Eder Gastroscopes.
3. No change or conversion necessary on the Eder-Hufford Flexible Esophagoscope.
4. Longer than the Standard Gastroscopes to permit full advantage of the flexible portion to be felt after it has been passed through the Esophagoscope.
5. Simplifies combination Gastroscopy and Esophagoscopy!
6. Instruments can be used individually or combined!
   One introduction — Two examinations!
7. Patient's discomfort reduced! Doctor's diagnostic areas increased!

For more information, **prices and descriptive folder #89**

Write the manufacturer

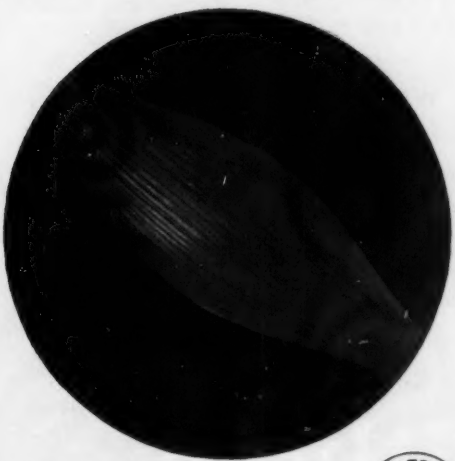
EDER INSTRUMENT COMPANY **2293 N. Clybourn Avenue**
Chicago 14, Illinois

SEE OUR EXHIBIT AT BOOTH 14

For anxiety, tension and muscle spasm in everyday practice.

- well suited for prolonged therapy
- well tolerated, relatively nontoxic
- no blood dyscrasias, liver toxicity, Parkinson-like syndrome or nasal stuffiness
- orally effective within 30 minutes for a period of 6 hours

RELAXES BOTH MIND AND MUSCLE
WITHOUT IMPAIRING MENTAL OR PHYSICAL EFFICIENCY



Miltown®

tranquilizer with muscle-relaxant action

2-methyl-2-n-propyl-1,3-propanediol dicarbamate — U. S. Patent 2,724,720

Supplied: 400 mg. scored tablets
200 mg. sugar-coated tablets

Usual dosage: One or two 400 mg. tablets t.i.d.

Literature and samples available on request

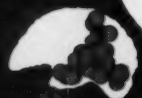
MILTOWN® THE ORIGINAL MEPROBAMATE — DISCOVERED AND INTRODUCED BY WALLACE LABORATORIES

WALLACE LABORATORIES
New Brunswick, N. J.

CM-9109

SEE OUR EXHIBIT AT BOOTH 2

now "... *care of the man rather than merely his stomach.*"[1]



Milpath®

Miltown® + *anticholinergic*

controls

gastrointestinal dysfunction

at cerebral *and* peripheral levels

tranquilization without barbiturate loginess

spasmolysis without belladonna-like side effects

for *duodenal ulcer • gastric ulcer • intestinal colic spastic and irritable colon • ileitis • esophageal spasm G. I. symptoms of anxiety states*

prescribe: 1 tablet t.i.d. at mealtime and 2 at bedtime.

"Milpath"

Miltown® + *anticholinergic*

Formula:

Miltown® (meprobamate) 400 mg. (2-methyl-2-*n*-propyl-1, 3-propanediol dicarbamate) U. S. Patent 2,724,720

tridihexethyl iodide 25 mg. (3-diethylamino-1-cyclohexyl-1-phenyl-1-propanol-ethiodide)

1. *Wolf & Wolff, Human Gastric Function*

Literature, samples, and personally imprinted peptic ulcer diet booklets on request.

WALLACE LABORATORIES New Brunswick, N. J.

for abnormal bowel function use

L. A.® Formula

It is important, when inducing normal bowel function, to supply a non-irritating bulk to the colon, especially in those cases in which it has been necessary to eliminate from the diet the high roughage foods containing irritating bulk (lignin and cellulose).

It has been shown[1] that the colon resumes a more normal peristaltic pattern[2] when it is supplied with a stool of medium soft consistency of sufficient bulk[3], especially if the indigestible portion of that bulk consists primarily of hemicellulose[4].

L. A. FORMULA is a vegetable concentrate of naturally occurring hemicelluloses. It is derived from blond psyllium seed by our special Ultra-Pulverization Process and simultaneously dispersed in lactose and dextrose. It provides just the moist, smooth, effective[5] bulk so essential to normal peristalsis.

Furthermore, L. A. FORMULA is undetectable in fruit juice and milk, pleasant tasting in water, and available in 7 and 14 ounce containers at significantly lower cost-to-patient prices. That's why we say L. A. FORMULA

... to normalize

1. Dolkart, R. E., Dentler, M., & Barrow, L. L., Illinois M. J., 90:286, 1946
2. Adler, H. F., Atkinson, A. J., & Ivy, A. C., Am. J. Digest. Dis., 8:197, 1941
3. Wozasek, O., & Steigman, F., Am. J. Digest. Dis., 9:423, 1942
4. Williams, R. D. & Olmsted, W. H., Ann. Int. Med., 10:717, 1936
5. Cass, L. J. & Wolf, L. P., Gastroenterology, 20:149, 1952

Formula: 50% plantago ovata coating dispersed in lactose and dextrose.

Made by **BURTON, PARSONS & COMPANY** *Since 1939*

Originators of Fine Hydrophilic Colloids

WASHINGTON 9, D. C.

SEE OUR EXHIBIT AT BOOTH 18

put a new ending on this old tale

Old King Hal has many modern counterparts: executives who entertain . . . husbands who like "good eating," wives who serve "something different" . . . children who like "gooey" sweets. But for each the aftermath is often uncomfortable.

With Gelusil tablets or liquid, however, you quickly, soothingly relieve acute and chronic excessive gastric acidity! And Gelusil helps you manage the gnawing pain of peptic ulcer, too.

Gelusil stabilizes burning gastric acid within normal pH range, usually in minutes.

- *Gelusil works fast*
- *Gelusil is long-lasting*
- *Gelusil won't constipate*

Your patients get nightlong, sleep-assured protection with new formula Gelusil-Lac. By combining Gelusil's proven antacid action with the buffering effect of high-protein, low-fat milk solids, Gelusil-Lac *prevents* "middle-of-the-night" gastric pain!

there's no laxative in Gelusil . . . Gelusil needs no laxative

Gelusil®/Gelusil-Lac

WARNER-CHILCOTT

100 YEARS OF SERVICE TO THE MEDICAL PROFESSION